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Energy Issues and ALTERNATIVES for Newfoundland Remote Communities

Conference Proceedings

Canada

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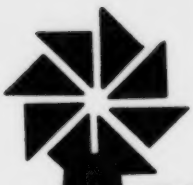

Energy Issues and ALTERNATIVES for Newfoundland Remote Communities

Conference Proceedings

Conference sponsored by:
Remote Community Demonstration Program
of Energy, Mines and Resources Canada

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Corner Brook, Newfoundland
November 26-29, 1985

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St. John's, Nfld.

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FOREWORD

Seemingly, they came from everywhere. Community representatives from the fiords and panoramic bays of the South Coast, town council members from the inlets and islands of Labrador, Development Association representatives from the Great Northern Peninsula, government observers from scenic British Columbia and the rugged expanse of the Northwest Territories, corporate representatives from Ontario and the United States and the St. John's bureaucrats, all descended upon Newfoundland's second city, Corner Brook, for a few days in the fall of 1985. Townies and baymen, yanks and mainlanders alike, gathering together on common and perhaps neutral ground, to meet together, to eat together, to drink together, to argue together, to listen together and to plan together. For each and every one of them, from his or her own individual perspective, had an interest in energy matters in remote communities. Each man and woman attending the Energy Issues and Alternatives Conference in Corner Brook, Newfoundland, Nov. 26-29, 1985, brought to it his or her individual contribution and went away more knowledgeable and richer in appreciation of the contribution of others.

The conference was organized by Energy, Mines and Resources Canada through the Conservation and Renewable Energy Office as an initiative under the Remote Community Demonstration Program (RCDP). The following proceedings provide a written account of the various presentations given over the 2½ days. This conference was the first in a series of conferences to be sponsored by RCDP in various locations across Canada.

The Energy Issues and Alternatives Conference, as suggested by its title, was designed to bring to the attention of the various government and community agencies the most important energy issues affecting remote communities throughout Newfoundland and Labrador in a forum where input could be received from all affected parties. With the issues in the forefront, renewable energy and energy conservation alternatives were presented in context with Newfoundland's available resources such as hydro, wood, peat, wind and conservation. The conference ended with three concurrent workshop sessions - one on wind, one on wood and peat, and one on hydro. These sessions allowed for community-specific discussions to take place on energy technology opportunities in various communities. The workshop sessions were then presented in summary form to the entire conference in the closing session.

These proceedings are a compilation of the papers presented, the questions fielded and answered, and the workshop findings prepared; as such, they have an intrinsic value all their own. However, being mere words on paper, these proceedings have a value which is in some respects limited. For most conference participants, regardless of their geographic origin or their particular representation, the true value of the conference, and one which a book of proceedings, however comprehensive, can never portray, lies in the sense of interplay, of interaction, which took place over the 2½ days between groups and individuals which contributed to a greater understanding of each other's needs and aspirations, each other's problems and solutions and each other's hopes and dreams.

Nat French
Conference Chairman

COMPTE RENDU DE LA CONFÉRENCE SUR LES QUESTIONS ÉNERGETIQUES ET LES ÉNERGIES DE RECHANGE POUR LES COLLECTIVITÉS ÉLOIGNÉES DE TERRE-NEUVE ET DU LABRADOR

Résumé

Au Canada, le pétrole demeure la principale source d'énergie pour près de 400 collectivités éloignés, dont 79 situées à Terre Neuve et au Labrador. Ill est peu probable que ceux-ci soient un jour reliées avec les réseaux principaux d'electricité ou de gaz.

Dans plusieurs endroits, il est possible que le pétrole ne soit pas la meilleure source d'énergie à utiliser. La livraison est souvent difficile et sujet à des retards. Les frais de livraison aussi s'ajoutent à des coûts qui sont habituellement élevés. La production d'électricité à partir du mazout peut limiter la quantité d'électricité dont on dispose pour les habitations, la collectivité et les industries locales.

Afin d'aider à reduire la dépendance sur le pétrole, Énergie, Mines et Ressources Canada a créé le Programme de démonstration dans les collectivités éloignées (PDCE). Ce programme est conçu pour aider les collectivités éloignées et les organismes qui les approvisionnent en énergie à identifier des énergies de remplacement plus appropriées et des occasions d'économiser l'énergie. La premiere phase du Programme, maintenant terminée, a aidé à faire la mise sur pied de 80 études, 12 de ceux-ci à Terre-Neuve et au Labrador.

La conference de Terre-Neuve, parrainée par ce programme, fut organisée afin d'apporter à l'attention aux divers gouvernements et organismes communautaires les questions importantes affectant les collectivités éloignées de cette province par l'intermédiaire d'un colloque dont tous furent invités à fournir des informations.

Au début de le conference, il fut remarqué selon plusieurs études que les collectivités éloignées de Terre-Neuve pourraient reduire leur consommation de pétrole jusqu'à 75% dans 10 ans de façons pratiques et économiques. Ces façons, sujets de discussion visés avant la fin de la conference, sont celles des économies d'énergies et de l'augmentation d'utilisation du bois, de la puissance de l'eau et du vent.

Les organismes suivants furent representés par des orateurs: Énergie, Mines et Ressources Canada, Ministère des Mines et de l'Énergie de Terre-Neuve, Ministère du développement Rural, Agricole, et du Nord de Terre-Neuve, la Newfoundland et Labrador Hydro, la Newfoundland Public Utilities Commission.

En plus, les exports-conseils suivants, impliqués dans la Phase I du Programme, furent aussi representés par des orateurs: la Fenco Newfoundland Ltd., la ShawMont Newfoundland Ltd., la Acres International Ltd., la Highlands Contracting Ltd., la Terpstra Engineering Ltd., la IDP Consultants Ltd., et la Provincial Consultants Ltd. Près de 100 représentants de collectivités et d'associations de développement ont assisté à cette conférence.

CONFERENCE AGENDA

CONFERENCE CHAIRMAN
Mr. Nat French
Regional Director
Energy, Mines and Resources Canada
St. John's, Newfoundland

TUESDAY, NOVEMBER 26, 1985

7:30 p.m. - 9:00 p.m.	**Registration and Cocktails** Lobby Ballroom - Sponsored by Provincial Department of Mines and Energy

WEDNESDAY, NOVEMBER 27, 1985

8:00 a.m. - 9:00 a.m.	**Late Registration** - Lobby Ballroom
9:00 a.m. - 9:30 a.m.	**Official Opening** - Main Ballroom Nat French, Regional Director Energy, Mines & Resources Canada
9:30 a.m. - 10:30 a.m.	**Introduction - Policy Section and National Perspective** Elliot Rodger, Manager, Remote Community Demonstration Program, Energy, Mines & Resources Canada
10:00 a.m. - 10:40 a.m.	**Utility Perspective** David Collett, P. Eng., Vice-president of Operations, Newfoundland and Labrador Hydro Corporation
10:40 a.m. - 11:00 a.m.	**COFFEE BREAK**
11:00 a.m. - 12:30 p.m.	**Government Perspectives**
	Provincial Philip Graham, Director of Energy Programs, Department of Mines and Energy
	Federal Graham French, Head, Energy Project Management, Energy, Mines & Resources Canada

12:30 p.m. - 2:00 p.m.	**LUNCH** (on your own)
2:00 p.m. - 3:30 p.m.	**Community Development** Martin Lowe Department of Rural Agricultural and Northern Development
3:30 p.m. - 4:00 p.m.	**Public Utilities Commission** Gordon MacDonald, Chairman, Public Utilities Board
4:00 p.m. - 4:10 p.m.	**COFFEE BREAK**
4:10 p.m. - 5:00 p.m.	**Question and Answer Period**
5:00 p.m.	**Free Time to View Displays**
7:30 p.m. - 9:30 p.m.	**Dinner** - Sponsored by Energy, Mines and Resources Canada

THURSDAY, NOVEMBER 28, 1985

8:30 a.m. - 8:45 a.m.	**Introduction** - Main Ballroom Paul Duffett, P. Eng., Energy, Mines & Resources Canada, Remote Community Demonstration Program Phase 1 Feasibility Studies
8:45 a.m. - 10:15 a.m.	**MINI-HYDRO STUDIES** - **Mary's Harbour** Newfoundland and Labrador Hydro - **Rigolet** Sheppard, Hedges & Green Ltd. - **L'Anse-au-Clair** Fenco Newfoundland Ltd. **Question and Answer Period**
10:15 a.m. - 10:45 a.m.	**COFFEE BREAK**
10:45 a.m. - 12:30 p.m.	**WIND STUDIES** - **South Coast** ShawMont Newfoundland Ltd. - **St. Anthony** Fenco Newfoundland Ltd. - **Labrador Coast** ShawMont Newfoundland Ltd. **Question and Answer Period**
12:30 p.m. - 1:45 p.m.	**LUNCH** (on your own)

1:45 p.m. - 3:15 p.m.

BIOMASS STUDIES
- **Roddickton**
  ACRES International Ltd.
- **Coastal Labrador**
  Highlands Contracting Ltd.
- **Cartwright/Black Tickle**
  Terpstra Engineering Ltd.

Question and Answer Period

3:15 p.m. - 3:30 p.m.

COFFEE BREAK

3:30 p.m. - 5:00 p.m.

OTHER STUDIES
- **Potential for Energy Conservation and Fuelwood Substitution**
  IDP Consultants Ltd.
- **Pinsent's Arm/Norman Bay**
  Provincial Consultants Ltd.

Question and Answer Period

Introduction to Workshop Sessions - Paul Duffett, Main Ballroom

7:30 p.m. - 9:30 p.m.

Dinner - Sponsored by Newfoundland and Labrador Hydro Corporation
Guest Speaker - Honourable J. Dinn, Minister, Department of Mines and Energy

FRIDAY, NOVEMBER 29, 1985

8:45 a.m. - 10:30 a.m.

CONCURRENT WORKSHOP SESSIONS

1. **Mini-Hydro**

Chairman - Peter Sandland
Energy, Mines & Resources

Theme - "Is hydro power a practical source for small power requirements?"

Panel Members:
- George Sturge, Hydro
- David DeMontmorency, Galt Energy Systems
- Laban Davis, Davis Engineering

2. Wind Energy

Chairman - Graham French
Energy, Mines & Resources

Theme - "Does wind energy make cents?"

Panel Members:
- Monique Carpentier, Energy, Mines & Resources
- Dave Hood, ShawMont Newfoundland Ltd.
- Craig Toepfer, Earth Energy Systems
- Duncan Hume, Howden Group Canada

3. Biomass Energy

Chairman - Paul Duffett
Energy, Mines & Resources

Theme - "How long can remote communities continue to burn wood at current rates?"

Panel Members:
- Maurice Mills, ACRES International Ltd.
- Bill Buggie, Department of Forest Resources and Lands
- Bill Alexander, Canadian Forestry Service
- Pat Hewitt, Southern Avalon Peat Harvesting

10:30 a.m. - 11:00 a.m.	**COFFEE BREAK**
11:00 a.m. - 11:30 p.m.	**Workshop Overviews Presentation** - Main Ballroom
11:30 a.m. - 12:00 p.m.	**Question and Answer Period**
12:00 p.m.	**Official closing**

Wednesday, November 27, 1985

Introduction

Nat French, Conference Chairman
Regional Director,
Conservation and Renewable Energy Office
Department of Mines, Energy and Resources (EMR)

Good morning ladies and gentlemen and welcome to the first **Energy Issues and Alternatives for Remote Communities** conference.

Why are we here? Some of you are probably uncertain.

We're here because a certain amount of energy-related activity of a technical and economic nature has taken place in remote communities. When governments, businesses or utilities undertake resource-based studies it always creates a certain amount of interest, and rightfully so, because studies being done on a resource base usually mean the lives of people in the various communities studied are going to be affected. The purpose of this conference is to tell people about those studies.

There's not much point in doing feasibility studies only to have the reports sit on a shelf, or become working documents for utilities or government departments. We want to get those feasibility studies out into the communities and we want the communities to respond. We want them to tell us if our approach is wrong, if there's a better approach. We want to encourage dialogue.

Our first speaker is Elliot Rodger, Manager of the RCDP in Ottawa with the Renewable Energy Division of EMR.

Elliot Rodger, Manager, RCDP (Ottawa)
Renewable Energy Division, EMR

It's a pleasure to be back in Newfoundland. This is my third trip here and my first time out of St. John's. I hope to visit more areas outside of St. John's and perhaps meet some of you in your own communities.

To echo Nat's remarks, this is the first conference that the **Remote Community Demonstration Program (RCDP)** has sponsored. We hope to do more of them in each of the other provinces and territories in the country. This conference will be a success if it opens your eyes to practical and realistic energy solutions for remote communities in Newfoundland and Labrador.

We hope that you will be active participants both in the question periods and in the workshops. There are many resource people in attendance and I hope community representatives take the opportunity to tap that knowledge.

Before going any further I'd like to acknowledge the co-operation we've received from the provincial government's Department of Mines and Energy and from Newfoundland and Labrador Hydro Corporation. I also acknowledge the work of Nat French, Paul Duffett and Graham French in setting up this conference.

Remote communities are closely tied to the history of Canada and have played a key part in the economic development of the country--from exploration of the fur trade to recent resource developments. Many of today's remote communities began as self-sufficient outposts depending on locally available resources for their existence. Today, 375 remote communities share varying degrees of reliance on oil products for electricity generation, space heating and for transportation. Most communities have opportunities to increase their use efficiency of this energy source and indeed to seek alternative sources of energy.

Remote communities fall into several categories. The largest category is native communities. Resource towns belong to another large category. They may be transportation hubs or commercial centres for large districts or dispersed populations. Energy costs to these communities are typically higher than in other centres in Canada in spite of large subsidies from various provincial and federal agencies and indeed, resource development companies. The harsh climate found in many remote communities, combined with relatively low incomes and high energy prices, make the total cost of energy potentially a higher percentage of community income than in the rest of Canada. Many communities have only been able to adapt to these circumstances by curtailment or restriction of energy use, the use of local, free resources--primarily wood--and a reduction in the standard of living and comfort in their homes and other buildings.

The incentive in saving energy is an economic one--from both local and national perspectives. The high heating demand in many remote communities coupled with the high transportation cost of energy, combine to create energy costs far in excess of the rest of the country. Costs are potentially so high that severe economic constraints result because energy expenses can become the largest household expense for a low-income family. Consumer energy costs are relieved in remote communities through locally available energy--again mostly wood--and through subsidies from government. Consumers adapt to high energy costs by space heating smaller homes to a lower comfort level and by curtailing the use of electricity either voluntarily or by regulation. Methods to assist with the goals of energy conservation and reduction of petroleum use are available to many communities. Conservation can be achieved through upgraded building insulation, waste heat recovery from diesel generators and energy management.

Fuel substitution can occur with the use of small hydro, wood, wind, and solar power generation systems, as well as other locally available energy sources. Connections, in some cases, can still be economically made to central electricity and natural gas systems. There are also a number of developing energy technologies. Many remote communities already make use of some of these options but there could be more widespread use of them with a consequent reduction in energy demand. Nationally, we estimate the use of energy could be reduced by 25% to 26.7 petajoules (a bulk unit of energy) a year. The use of oil could be reduced by 38% to 13.2 petajoules per year if remote communities improved their energy-related infrastructure and developed feasible, local sources of energy. The resulting cost of oil saved would be $80 million a year based on the average cost of savings potential in each community.

The rate of conversion in remote communities to improved energy systems has been relatively slow. A number of technical, economic, and institutional barriers have been identified which are hindering that process. Technical barriers include the requirement for proof of technical feasibility, and the development of successful maintenance programs utilizing management and technical skills within the community. This is one topic that should be addressed in the workshops.

Economic barriers include the requirement for proof of economic feasibility and a requirement to finance the high capital costs of many conservation and alternative energy systems.

Institutional barriers relate to the diverse interests of the many agencies--both government and commercial--which are involved in remote community energy supply. Agency policies and the physical infrastructure which have been built because of them, serve to limit some of the technical options available and introduce economic constraints imposed by the agencies who view their interests as being affected.

We did a study of all the remote communities in Canada based on known energy conservation and alternative energy-supply options. The ensuing report projects the energy savings, with and without conservation and alternative energy supply options, for each community in the country (including the 79 in Newfoundland and Labrador). The report is available through the office of EMR. The document is entitled Energy Overview Study of Remote Communities in Canada.

The magnitude of energy trend projections in remote communities varies greatly from communities that have the potential to be off oil completely, to those in which only a modest efficiency improvement is possible. There are some communities in Canada that will always be on diesel power generation systems....until the oil runs out.

The largest reductions could occur where there are untapped wood and hydro resources. Our analyses show that remote communities across the country have a potential total energy reduction of up to 21%, and a 49% reduction in the use of oil over 10 years. The projection that was done for Newfoundland indicates a potential reduction of 75%. It is the desire to meet these potential savings that gives purpose to this conference. The words "realistic", "practical", and "economic" are at play here. No community is interested in pursuing uneconomic or impractical ideas. Pragmatism is a by-word of the RCDP.

The RCDP has been running for three years in Canada with the exception of New Brunswick, Nova Scotia, and Prince Edward Island. The program involves 375 communities of which 79 are in Newfoundland and Labrador. The program was established in 1982 to help remote communities and their energy-supply agencies to identify and assess off-oil options, means to improve energy use efficiency, and to try out some projects. To do that we split the program into two phases: Phase I is completed. It funded 81 studies across the country involving 275 communities. The studies identified and assessed a whole range of opportunities, from the very practical, such as wood and hydro systems, to more futuristic technologies based on photovoltaics and tidal power. Phase II is a demonstration phase. We are seeking to help start up a number of projects--actual installation of capital projects in remote community settings--to demonstrate that a variety of technologies and measures can work.

One of the keys to the RCDP is information transfer--spreading the knowledge around to people who can benefit from that knowledge. This conference is one such means of facilitating information transfer.

In Phase I we looked at some grid extensions. We looked at biomass, wind, photovoltaic, hydro, geothermal, and tidal systems. Tidal generated power is an interesting option for Newfoundland. There are a whole range of energy conservation options and they're applicable to every community in the country. A number of the studies arising from Phase I are leading to immediate implementation even in the absence of EMR funding.

I'd like to acknowledge the agencies and communities in Newfoundland and Labrador that worked with us in Phase I. We couldn't have done it without their support. Our program is a catalyst. We provide seed money and advice to enable others to act. I'd especially like to acknowledge Newfoundland and Labrador Hydro, the provincial Department of Municipal Affairs, the provincial Department of Mines and Energy, the Newfoundland Department of Forest Resources and Lands and, the L'Anse-au-Clair township, all of which contributed money to Phase I studies.

In Phase II there are a number of projects in residential space heating from which you can expect to see results in three year's time. Residential space heating accounts for 36% of energy used in a typical remote community. Approximately 50% of residential space heating across the country is derived from oil. Even in homes using wood heat there are opportunities to use that fuel more efficiently. We'll be funding residential space heating projects in three areas: improving the energy efficiency of new homes through improved design and construction techniques, improving the energy efficiency of existing homes through energy conservation measures and more efficient energy consuming equipment, and the substitution of wood for oil while encouraging wood's safe and efficient use.

In the area of non-residential space heating--commercial and institutional buildings--we hope to fund projects that include improving the energy efficiency of institutional buildings such as schools, through energy conservation measures and more efficient energy consuming equipment, substituting wood for oil (quite relevant to Newfoundland), reducing oil consumption by linking buildings into district heating systems and, using waste heat from diesel generators. Non-residential facilities account for 19% of energy consumption and are often high energy users.

Most remote communities' power is produced by diesel generators. There are still some communities in Canada that do not have power. Power generation accounts for 28% of remote community energy consumption. Projects that we hope to fund to increase the efficient use of diesel include load management of diesel-based systems and utilization of waste heat from diesels, substitution of oil with wood for generating electricity (very applicable to Newfoundland), small hydro projects, wood-fired generators and wind-generated power systems.

In the field of general energy awareness, which is the way that we can reach all communities, we are encouraging community energy planning alerting communities to their energy futures and tying that awareness into the physical, social, economic and industrial development of their communities.

We will be sponsoring a number of conferences across the country of which this is the flagship conference. We will be doing extensive information transfer. For example, going into communities to present slide shows, having technical experts give presentations, and distributing informative literature. This information transfer process will be ongoing over the next three years. You will be hearing from us.

In conclusion, the reason for pursuing energy conservation and alternative energy supplies is simple. High energy costs are a major restriction on community development.

I would encourage representatives of the community development councils and institutional agencies in attendance, to obtain a copy of the Energy Overview Study of Remote Communities in Canada. It contains overviews of all Phase I's 81 feasibility studies with current economic and technical information. It is a very useful and illuminating document.

Nat French, Conference Chairman

Our next speaker is Dave Collett, Vice-president of Operations, Newfoundland and Labrador Hydro. Dave is going to speak to you today on the utilities' perspective, i.e., a policy overview with respect to Hydro's involvement with remote communities.

Dave Collett, Vice-president of Operations
Newfoundland and Labrador Hydro Corporation

I was thinking, in the last few minutes before I got up here, that I remember a similar conference that I attended some years ago on the subject of energy. As a matter of fact it was just after the oil embargo of the mid-1970s. One of the speakers there, his opening line, which I think I can borrow, was that he felt somewhat like the seventh husband of Elizabeth Taylor on their wedding night: he knew what he had to do but he was damned if he knew how to make it interesting. That's somewhat the situation I find myself in.

I'd certainly like to take the opportunity to thank the conference organizers for the invitation to Hydro to participate in the conference. From what I see on the agenda, you've certainly put together a most interesting and informative range of topics related to energy alternatives for remote communities.

I think in this respect it is fitting and very appropriate that Hydro has the opportunity to present to you the utilities' perspective in that through our subsidiary, the Power Distribution District of Newfoundland and Labrador, (PDD), we have the responsibility for the provision of electrical service to some 26,000 customers in 190 communities all across Newfoundland and Labrador, and where, in the majority of these communities, the cost of providing electrical service far exceeds the revenues received.

Recognizing the conference agenda and the suggestions of the conference organizers, I have structured my presentation in four parts to provide you with the utility perspective on these issues.

I want to first of all provide you with a very brief introduction to Hydro, particularly to PDD, so you will have an appreciation of the scope of our operations. Secondly, I want to give you an appreciation of the different rate structures that prevail in

communities across Newfoundland, particularly between the isolated diesel communities and interconnected system. I want to tell you a little bit about what we've been involved with in alternate energy options for the communities, take a look at the future, and conclude with a brief discussion of our policy overview on the use of alternate energy in remote communities, and give you some of our considerations in this respect.

Background on Hydro:

Hydro is a Crown corporation owned by the Province, established to centralize under one authority the management and control of all electric generation, transmission and distribution assets owned by the Province, and to assume responsibility for the future development of the province's electric resources.

Hydro, on behalf of the government, operates and administers the affairs of the Power Distribution District (the PDD) of Newfoundland and Labrador. The PDD is the vehicle with which the government maintains the rural electrification program. It is concerned with the provision of generated capacity for the isolated diesel systems, the construction and operation of distribution facilities, and purchases of power from the interconnected grid for subsequent distribution to our customers.

At present, Hydro, as a basic wholesaler of electricity, has only nine customers. Seven of them are of the industrial class, i.e., Kruger at Corner Brook, and the remaining two customers are of a utilities' nature--Newfoundland Light and Power and the PDD. Since 1977, the rates Hydro charges its customers have been governed by The Electric Power Control Act. Under that Act, Hydro is required to charge rates to all its customers to recover its cost of service and provide a margin of profit sufficient to achieve and maintain a sound financial position. The Act also provides that the rates Hydro charges utilities be subject to regulation by the commissioners of the Public Utilities Board (P.U.B.).

On the island of Newfoundland, all domestic customers who are supplied from the interconnected grid pay the same rate no matter where they may be geographically located, whether they are supplied by Newfoundland Light and Power or the PDD.

The rates which Newfoundland Light and Power charges its customers are approved by the P.U.B. as well, and are based on the company's internal costs plus, of course, the cost of purchased power from Hydro. The rates then that the PDD charges its customers connected to the provincial grid, are on the same basis as Newfoundland Light and Power. They are identical to the Newfoundland Light and Power structure. We make them that way.

Customers of the PDD in Wabush and Happy Valley/Goose Bay now pay different rates. However, it is the objective of the PDD to move towards a uniform rate structure for all customers on the interconnected system in Labrador. These rates are now at a very low level relative to the island interconnected customer's, due primarily to the source of generation into which they're tied--Churchill Falls.

Customers of the PDD who are served from isolated diesel systems pay higher electricity rates than those on the interconnected system, with the exception of the first 500 kilowatt hours of consumption per month for domestic customers. For consumption levels beyond that, the unit cost per kilowatt hour rises significantly. Even at those levels revenues are still not sufficient to meet costs, thereby resulting in operating deficits ($23 million for the period 1984 - 85).

I have calculated the monthly cost to consumers in the various areas based on the 1985 rate structure, using monthly energy consumptions of 500 kwhs and 750 kwhs.

500 Kilowatt Hours Consumption

Wabush	$6.60
Happy Valley/Goose Bay	$26.50
Island customer (interconnected system)	$39.60
Isolated customer (diesel system)	$39.60

750 Kilowatt Hours Consumption

Island customer (interconnected system)	$54.65
Isolated customer (diesel system)	$61.68

It should be noted that for energy use on the diesel system in excess of 750 kilowatt hours, the cost difference between the island interconnect and the diesel system becomes much greater.

The oil price increases of the 1970s triggered Hydro's renewed interest in identifying lower cost energy sources particularly with respect to reducing the costs of energy generation in isolated communities. In this regard our activities have been concentrated in three areas: 1) the identification of adjacent, isolated diesel systems which could be interconnected and served by one plant, thereby permitting the use of larger and more economical diesel systems, 2) the identification of systems which could be economically interconnected to the provincial electrical grid, and 3) the economic displacement of diesel fuel by the use of mini-hydro plants operating in tandem with diesel generators.

In 1978, Hydro and EMR entered into an agreement to evaluate and demonstrate the potential for mini-hydro near communities with diesel gensets. This inventory and evaluation resulted in the identification and subsequent design and construction of a 425-kilowatt mini-hydro plant at Roddickton. The plant began operation in late 1980 and since then has generated around 5.4 million kilowatt hours which is the equivalent of 1.6 million litres of diesel fuel.

In the late 1970s, Hydro and the National Research Council of Canada carried out a field trial project using a 50 kilowatt, vertical-axis wind turbine located near our Holyrood generating station. Results with the first model were disappointing, mainly because the operating time during the trial period (1979-81) was low--approximately 33%. This low level of availability was attributed to the malfunction of small components and subsequent delays due to maintenance, repairs and replacements. The first model was subsequently replaced with an updated version in May 1982. For comparison purposes the availability of the second unit increased to a level of 86% for the period June 1982 - May 1983.

Selection of the Holyrood site was determined in part by the availability of maintenance expertise and was also based on wind regime data from a government monitoring agency. The wind regime data was later found to be incorrect, was in fact lower, which lent support to our contention that a site-specific monitoring program be conducted to obtain the necessary wind data prior to a field installation.

This then summarizes our activities in alternative energy options prior to Phase I of the RCDP. Most of the studies under Phase I of the RCDP concerned alternatives to diesel generation, necessitating Hydro's involvement which ranged from the completion of a mini-hydro development study at Mary's Harbour, to providing statistical data and technical information on our different diesel systems.

At Hydro we recognize that potential exists for alternative or complementary energy sources and we are actively pursuing possible options. Through our present and near-term capital program we expect to move forward in several areas that we feel offer the most promise:

1. In St. Anthony we have instituted a wind monitoring program. By the end of 1986 we should have obtained site-specific data that will enable us to make a definitive decision on a demonstration scale, wind energy project.

2. Similarly, we have purchased and assumed full responsibility for the operation and maintenance of the Holyrood vertical-axis wind turbine. The system will be monitored and the data gathered will determine the final disposition of the project.

3. In the Roddickton area, Hydro intends to carry out a final feasibility study to address technical issues arising from the RCDP report on biomass utilization for the Roddickton/Main Brook region.

4. Hydro continues to investigate options to facilitate the economic interconnection of several of the remaining diesel systems into the island interconnected grid.

5. For those systems that for various reasons will remain isolated from the main grid, we are investigating ways to improve overall plant efficiency. For example, Hydro is conducting an in-house pre-feasibility study to look at utilizing waste heat at some of these plants.

At present the Newfoundland and Labrador Hydro Act gives Hydro the exclusive right and franchise, limited to the island of Newfoundland, to develop any new hydro-electric sites, subject to any rights given prior to that Act. Further, Hydro's rights in Labrador, other than for the Lower Churchill watershed, are still vested with the Government of Newfoundland and Labrador. In keeping with this, our policy in the past has been not to restrict others wishing to develop micro- or mini-hydro sites provided that these developments are strictly for the developers' own use and do not impact on the province's generation expansion plans, or Hydro's responsibility for future development of the province's electrical resources.

We see no reason to deviate from this position in the future other than to reemphasize that interested parties who may be considering such developments are responsible for complying with all government regulations and for obtaining the necessary permits and clearances from the appropriate government departments.

Developers who wish to generate electricity by whatever means and who wish to interconnect with the provincial grid or isolated diesel systems, will be viewed in a different manner. It is necessary in this instance to address the operating aspects of such an interconnection and both the economic and technical considerations. From an operations' perspective, I think it is sufficient to say that Hydro's objective in all its activities is to provide its customers with the lowest cost energy, consistent with accepted standards of safety and reliability. Any agreement that Hydro enters into with any developer must conform to these stated aims.

Economically, the price that Hydro can pay for power from any such development must be cost competitive with our present sources, and is subject to approval by the P.U.B. We are of the opinion that developers will be classified as public utilities and as such will be governed by the Electric Power Control Act, and therefore must seek approval for rates from the P.U.B. However, we do recognize in any arrangement we may enter into, that these rates should reflect a fair rate of return to the developer based on his investment and operating costs.

From a technical point of view, the developer will bear the cost of delivering such power and energy to a suitable point of interconnection and will have to enter into an operating agreement for the delivery of such power and energy in a technically suitable, safe and reliable fashion.

Most of the alternative energy options that I have discussed involve substantial capital investment and in many cases simply result in fuel displacement. Because of the significant subsidy that Hydro receives annually from the government for the operation of the PDD, any benefits that become available over the long term in reducing costs must first be applied against reducing the subsidy before we can consider lowering rates. We realize this is the issue that is most often misunderstood by customers of the PDD in remote communities. Further, when evaluating the cost effectiveness of various energy options, Hydro's practice is to compare on a present-worth basis the cost of various alternatives. The alternative that has the lowest present-worth cost we deem to be the one preferred. This, of course, assumes that we must add new generation because of increasing load.

One must recognize that many of these alternative technologies will result in redundant facilities and their benefit will reside entirely in fuel displacement. While this is a positive fact, the fact that they do not, in most cases, displace future investment, will create a hurdle that will hamper their cost effectiveness. I don't tell you this to be negative. I simply want to make clear Hydro's perspective on all the relative benefits and associated risks with these emergent technologies.

One word of advice from Hydro to the consultants and manufacturers in the audience: from Hydro's point of view, if these alternative energy systems are to achieve a competitive advantage, what you have to do is get capital costs down and energy output up. That's the best of both worlds but that's effectively what's required. In our experience with the wind energy system and the mini-hydro at Roddickton, the unit cost of energy has not been all that economic principally because of the capital cost of the installation. So, if you can get your capital costs down and the energy up, then these systems become much more attractive. This is where attention can be focused on standardizing design concepts and taking advantage of package installations.

In conclusion, Hydro looks forward to working with you in the realization of lower energy costs for all our customers. That is our objective, particularly with respect to the use of alternative energy technologies in remote communities.

Nat French, Conference Chairman

I think that Dave has pointed out in rather dramatic fashion the reasons why we are here today. He's put into clear perspective the magnitude of the problem that exists in off-the-grid communities in Newfoundland and Labador, and has described the efforts Hydro is making to overcome that problem.

I think he's also given us a lot of food for thought for the question and answer process which will take place at the end of the day.

Nat French, Conference Chairman

Our next speaker is Phil Graham. Phil is the Manager of Energy Programs with the Department of Mines and Energy. He directs a staff of about 15 to develop and implement programs in energy conservation and renewable energy.

Philip Graham, Manager of Energy Programs
Department of Mines and Energy

It's a great pleasure to have the chance to say a few words here this morning, to compare notes on some of the projects we've done over the past five years or so, and to share with you some of the lessons we've learned.

I think that Elliot Rodger and Dave Collett have given us a very good introduction, set the stage for us, and given the present situation and the opportunities that we have at hand.

In the first part of my presentation I'd like to present some of the provincial government's perspectives on energy use in remote communities.

The rationale for the provincial government's involvement in developing alternative energy sources in remote communities is self-evident. It is a stated priority of the provincial government to reduce energy costs, and as a result of that process, to capitalize on opportunities for the creation of employment.

Mr. Collett has told us about the high subsidy that is paid by the provincial government and taxpayers to provide electricity to remote communities. Clearly it is an important priority to try to reduce that subsidy.

Conservation and renewables can be an economic development opportunity over the next 10 years. Jobs can be created by doing those projects which are economically attractive, realistic and practical as Elliot Rodger has stated, which means the payback should be something less than six years.

The provincial government is currently involved in negotiations with EMR in Ottawa to seek funding support for a program of energy information studies and demonstration projects which will take place over the next two years. Beyond that, the hope is for the institution of a program geared to economic development. Such a program would provide financial assistance for acceptable energy projects. Regardless of the success of our discussions with EMR, the provincial Department of Mines and Energy will continue to push for provincial funding for energy programs.

Over the next 10 years there is a forecasted increase in demand for oil and a huge forecasted increase in the demand for electricity. The forecast does not indicate any increase in the incidence of use of alternative energy sources.

The present cost of energy in the province is $1.6 billion. If the present forecast is correct, that figure will rise to $2.3 billion by 1995. The anticipated cost increase is justification for a fairly vigorous program of energy conservation and identification of alternative energy sources. Such a program holds the promise of reducing the anticipated energy cost increase by $186 million of annual savings.

In terms of a sector breakdown, industrial users such as refiners, pulp and paper mills and ERCO consume huge amounts of electrical energy. There is a forecasted increase in energy demand for this sector (based on the addition of industrial capacity in the province). There is an opportunity to increase the percentage of alternative energy sources these consumers use, primarily in the area of wood fuel. In the residential sector there is marginal forecasted increase in the share of alternative energy sources used. The sector that is going to represent the greatest burden, in terms of energy demand, is transportation.

These statistics force us to ask the question "What can we do to reduce our demand for conventional energy sources?", i.e., oil and electricity. The answer is, you can save through conservation or you can substitute alternative fuels with their attendant lower costs.

For the diesel-supplied communities there is a potential energy costs saving of something in the area of $7 million per year--$3 million through conservation, $4 million through substitution of alternative energy sources.

In order to achieve this savings (in terms of reduced energy growth) we have to spend some money. From a provincial perspective it's estimated that the required expenditure will be in the neighbourhood of $.5 billion dollars. This estimate represents investment in conservation and substitution of alternative energy sources by all sector players.

Employment is an added benefit of such investment generating in remote Newfoundland communities an estimated 71.4 permanent jobs (over a 10-year period) or 714 one-year jobs. Doing energy retrofits, insulating, and constructing energy systems (wood fuel boilers and wind turbines) would create roughly 1,900 person/years of employment or 200 full-time jobs over a 10-year period. Following the construction phase there would be an operating phase which would provide an estimated 60 full-time jobs (again over a 10-year period). There would also be paybacks at the national level. Many of the materials used for insulation and energy-related equipment are manufactured in Canada.

We realize that this type of investment, although there are significant benefits, won't be made unless there is some stimulation given. Such stimulation includes informing all concerned parties as to what measures are applicable. In other words, information transfer.

To reiterate, there are significant opportunities for energy users to save money, and for government to stimulate economic development and employment in this province at a very reasonable cost.

To outline briefly some of the alternative energy sources available:

- The sun is the source of all energy we have. Unfortunately our climate is not conducive to the use of solar energy. But there are things we can do to use the sun. When building homes, locate the structure so that windows are facing to the south with the north side of the building sheltered. You can add a sun space. But remember that sun spaces, if heated constantly, will lose more heat than they get from the sun. There should be some way to isolate them from the main structure. Of course, proper insulation is a must.

- There are exotic types of solar energy such as photovoltaic energy. A photovoltaic cell converts sunlight directly into electricity which can be used to augment diesel- or gasoline-fired generators.

- Another source of energy is wood. Wood is burned in over half the homes in the province. A significant amount of residential heating comes from wood. Something like a third of all residential energy demand is satisfied by burning wood, which translates to approximately 400,000 tonnes of wood burned in Newfoundland homes each year. There are a variety of wood burning systems available, i.e., round wood systems and chip systems, to satisfy a variety of heating requirements.

- Another type of biomass is peat. Milled peat is used in large boilers and sod peat can be burned in stoves or fireplaces.

- Newfoundland is well-suited for wind exploitation wherein wind turbines are used to generate electricity. But There are still a number of questions to be answered with regard to the cost effectiveness of wind generated electricity. Equipment failure has been a problem in the past although many wind turbine manufacturers are confident their products have addressed those problems. In any case, the equipment must be able to stand the rigors of the Newfoundland climate and must operate with a minimum of maintenance. Wind systems, when they work, are quite attractive to off-grid communities.

- And of course, there is plenty of energy in falling water. There has been considerable expertise demonstrated in this province with respect to harnessing that energy. The main consideration with mini-hydro projects is cost. Mini-hydro installations are very expensive.

Introduction

Paul Duffett, EMR

Our next speaker is Mr. Graham French, Manager, Energy Projects Section, EMR.

Graham French, Manager,
Energy Projects Section, EMR

After the presentations by Mr. Elliot Rodger, Mr. Collett and Phil Graham, which were of a more general nature, I am going to try now to return to some of the more regional specifics of the RCDP in Newfoundland.

I'll apologize in advance if any of this material is dry. First off, it's qualitative, it's not quantitative. Unfortunately, you won't see facts and figures that you can use. I'm going to try to be fairly general. We're going to spend most of tomorrow with a great deal of the specifics of the program and of the work that's already gone on. I really don't want to scoop anyone or preempt their presentations.

I propose to provide an overview of what I'll call the current energy situation in Newfoundland remote communities--that is, current as of about a year ago. And with that, to provide a synopsis of work that we've done under the RCDP to identify conservation and energy alternatives that might be applicable to local conditions. Finally, I'm going to wrap it up by presenting from a regional perspective, the department's assessment of the issues and the best possible opportunities to improve the energy situation in these communities. Also, to talk a little bit about what we think our role as a government department is in realizing them.

Just a word on a definition: we've talked a lot about remote communities. For our purposes we've defined a remote community as having a minimum of 10 permanent residences, the community must have a planned lifespan of five years, and to be eligible under the RCDP, the community must have no current, firm plans for connection to the provincial grid.

When the RCDP started in 1982, our first order of business was to educate ourselves about remote communities. We needed to know how many there are, where they are located, what the populations of them are, their history, and their current status. We needed to know the level of community services and facilities, the type and level of economic activity. We wanted to know what transportation and communication links are available and we also wanted to know how energy is currently being consumed in those communities. Then we needed to know what energy alternatives are applicable to those communities.

To do that, we commissioned an energy overview study. The study was completed in December 1983. The purpose of the study was to profile the communities and to answer the questions I've just mentioned.

The first thing we found was, except for those communities that had been incorporated and where money had been provided to do municipal planning, there wasn't a whole lot of information available. To the extent of information that was available, we did provide individual profiles of the communities. Those profiles are available in the Newfoundland overview study.

We found there are 79 remote communities, by our definition, with a combined population of 30,000. The communities obtain their electricity from those 39 diesel systems operated by the PDD. The total energy consumption for those communities was about one-and-a-half million gigajoules--somewhere between 2% and 4% of total provincial energy consumption.

In terms of what options and alternatives are available to improve that situation, we also ran into some problems with information. Except for the hydro-electric potential, which was extensively surveyed through a study with Hydro, the information available on the indigenous resources in most of these communities was really inadequate to make any firm judgments.

We did find out from that study, by reviewing and updating, that the potential for small-scale hydro development exists for about a dozen communities. Wood, where it's available, is already widely used for home heating. There is further potential for using wood in the heating of commercial and institutional buildings. We also discovered that peat, in communities where it was available--Bishops Falls and St. Shott's notwithstanding--was completely undeveloped. Further, we found that Newfoundland is probably one of the best places in Canada for the application of wind energy, particularly for generating electricity. Again, there wasn't enough data generated to identify where such a resource might be used. Also, there is some potential for using the waste heat from diesel generators.

Even with the study in hand there were some major information gaps. We undertook to do some new work under the auspices of the RCDP. The RCDP was heavily involved in the work, financially and administratively, but in most cases it wasn't the lead organization. Virtually all the work was undertaken through the co-operation and sponsorship of a number of other other organizations, including the development associations, the Rural Development Council, the Department of Mines and Energy, the Department of Municipal Affairs, and Hydro. Over and above that, the RCDP managers also received a great deal of help from our regional advisory committee.

I'd like to make special mention of the special contribution made by Hydro. Their efforts went beyond simply being co-operative. Their financial contribution helped make possible a significant portion of the work done through the program to date, but perhaps more important has been the contribution of their time to overseeing the work carried out in Phase I, to participation on the regional advisory committee, and to participating in a major way in this conference. They are also actively participating in planning for future RCDP activities. Their contribution places them in a leadership role in the utility industry and demonstrates their genuine concern for the energy problems in remote communities.

Using the overview study as a guide, the focus of the work done in Phase I of the RCDP was chosen to achieve three things: 1) to update and add to the information available on indigenous remote community resources, 2) to determine the extent of the communities' involvement in energy conservation and, 3) to assess the technical and economic feasibility of a number of community-specific energy alternatives that arose from the overview studies.

Each of these studies will be presented in detail in tomorrow's sessions with specific conclusions and recommendations. For the purposes of this presentation, I will draw some very general conclusions from viewing these studies as a group.

General Conclusions

We discovered that residential energy conservation practices are not as widespread in remote communities as they are in other parts of the province. This is attributable to the fact that where wood is a major home heating fuel, and where homeowners directly obtain the fuel, there is little incentive to spend out-of-pocket dollars to reduce what essentially is the consumption of free wood. Also, since electric heating is not permitted and the first 500 kilowatt hours cost the same in remote communities as elsewhere, there's no great incentive to conserve electricity beyond what other electricity consumers in, say St. John's, would do. However, the truth of the matter in remote communities is that the electricity costs very much more to produce than in St. John's or in grid-connected communities. Because of the PDD subsidy, the incentive to conserve is lost. The real benefits of conservation accrue to the system as a whole by reducing generating costs and consequently the subsidy required.

Results of the studies also showed us that wood is in fact the dominant fuel for home heating in remote communities. But in a number of cases the resource is not as abundant as we might think. We are going to need some careful resource management to ensure it continues to be available at reasonable distances from the communities.

There is some possibility for wood as a heating fuel for commercial and industrial buildings, but the attractiveness may be marginal due, in some cases, to the relatively high cost of conversion and to the difficulty of ensuring a reliable supply of wood at reasonable prices. Using wood for generating electricity can also be practicable but in a limited number of cases. To be cost effective it requires a large community with a large electrical load and a large resource. When those conditions are met there is significant potential for oil displacement and for creating employment.

Hydro-electric potential in the small rivers near most of these communities is abundant and is fairly widely distributed geographically. In fact, of the resource options being discussed here, hydro has the greatest potential for oil displacement. Nonetheless, the economic attractiveness of hydro development is mediocre. It requires a very large investment. A 100-kilowatt plant can cost as much as a $1 million. It has minimal employment opportunities, and in some cases, particularly where salmon rivers are concerned, can pose environmental problems. Nevertheless, there is some potential, and under the right conditions and in the right communities it can be an attractive alternative.

Creating those optimum conditions might include the use of innovative designs or construction techniques to reduce capital costs, developing the resource for multiple uses such as combining a hydro-electric plant with a municipal water supply system, or, in the case where a large resource is available and a use can be found for the surplus energy, it may be possible to scale up some of these developments to a more economic size.

We've discovered that wind is an abundant energy source. To date, out of the work done in Phase I, we've identified at least 10 sites in eight remote communities that might be suitable for the installation of one or more windmills. But the technology for using wind to generate energy is much more complicated and less well-developed then for either wood or hydro. The equipment has been relatively expensive and we feel that more experience is required to establish its reliability. Still, the technology continues to improve rapidly.

Another problem with wind is that it's a variable resource. We only have the energy when the wind is blowing, making it difficult to control, particularly for generating electricity. But because the cost of generating electricity is higher in remote communities than elsewhere, we believe that remote communities are likely to be the place for wind power's first use.

To put things in perspective, the energy issues and problems of remote communities need to be examined from the point of view of the use to which an energy is being put, with an eye to the cost and efficiency with which it can be produced. Whatever the use, problems of reducing energy costs can be approached from two directions: 1) by practising conservation to reduce the demand for energy, and 2) by developing lower-cost ways of producing the supply. It's also fair to say that any rational plan to address these energy problems in remote communities must incorporate an appropriate mix of the two.

The RCDP itself is structured such that the national objective--to improve the security of supply and reduce the energy costs in remote communities--is achieved through the implementation of regionally sensitive plans. Plans for Phase II activities are already underway. It's our hope that your feedback and comments during and after this conference, will provide further input to this planning process. The planning that were doing for Phase II is based upon the principle that first all practical steps be taken to minimize energy consumption, and that the new technologies for supplying energy should be chosen to exploit local resources and to maximize the associated socio-economic benefits to the remote communities involved.

The RCDP is a demonstration program. It has neither the financial resources nor the mandate to bring about the widespread adoption of any energy conservation practices or new sources of supply on its own. It is a catalyst and an avenue for the dissemination of information, working through or in co-operation with other government departments, utilities and the communities themselves. The limited funds available for demonstration projects will be used for projects which support the primary role of the program. Demonstration projects will be chosen for their potential to reduce oil consumption significantly, the potential for replication in other communities, the socio-economic benefits to those communities and for the value of the projects themselves as examples that we can use in the information transfer process.

Information transfer and awareness can be effective in achieving this program goal--reducing energy costs and increasing self-sufficiency--only if it reaches out to all those who have a stake in the game. Effective information transfer requires at least the following: 1) that there be continued liaison with energy-supply agencies, 2) that there be more direct, structured communication with communities, 3) that there be increasing levels of expertise within the communities in dealing with government and in understanding the technologies involved 4) that there's a need to raise the level of confidence and expertise within the engineering profession and the construction industry in the particular problems of remote communities, and in applying alternative energy and conservation technologies to solving them.

Concerning the opportunities we think exist, based on the work we've done, it does not appear that energy conservation is going to have the same impact on consumption in remote communities that is achieved elsewhere. That's too bad. The greatest potential for energy conservation appears to be in reducing space-heating requirements. But the widespread use of low cost wood makes investments in energy conservation less attractive. Opportunities for conserving electricity are not particularly great. They include the use of energy-efficient appliances and lighting and in reducing domestic hot water temperature and usage. The savings to the consumer are unfortunately modest due to the PDD subsidy. But the cost savings to the system as a whole are quite substantial.

It's our intention to provide information to residents of remote communities informing them of what we think are the benefits both to the individual and the system. We're also examining the need for energy conservation demonstrations in remote communities.

We think the best opportunities to reduce energy consumption and to maximize the use of local energy resources in remote communities are almost all associated with the generation of electricity. In this regard we are actively pursuing opportunities to conduct demonstrations of technologies for generating electricity from wood, wind, and water.

The studies done in Phase I have shown us that the technologies to exploit these resources are now, or at least soon will be, reliable for use in remote communities, particularly in remote centres where technical problems can be both expensive and time consuming to correct. It must be stressed that for the foreseeable future diesel generators will remain a primary method of generating electricity in remote communities. The role of alternative energy sources will be to augment those generators and to minimize the fuel they consume.

From our perspective, these technologies appear to have the best chance for more widespread use in remote communities (beyond the demonstration projects). As such, much of the limited resources of the program will be used to realize these demonstration projects.

That does not mean these are the only opportunities available. For example, opportunities exist to use wood as a heating fuel in commercial and institutional buildings such as hospitals and schools provided that wood can be reliably supplied at a reasonable cost.

The waste heat from the diesel plant could be used to heat any relatively large building provided it is located reasonably close to the plant.

Wind power can be used for applications other than generating electricity (such as pumping water). It can also be used on a much smaller scale to generate electricity for individual users as well as by the utility.

Other technologies such as photovoltaics, wave energy and cycle charge systems to name a few may also be practical in specialized applications.

Summary

In summation, opportunities do exist to improve the security of supply and reduce energy costs in remote communities. Some of these opportunities have the potential for widespread use and thus can have a significant effect on both security of supply by replacing oil, and on energy costs. The potential of others is more modest. However, none of these technologies will replace diesel as the principal source of electricity in the foreseeable future.

A role of EMR is to act as a catalyst, to encourage others to seize the opportunities that do exist. Improvements in the energy situation in remote communities will only come about if the communities themselves take the initiative in solving their problems. We can be supportive and provide advice but we can't do it for you.

Introduction

Nat French, Conference Chairman

It's been a relatively interesting morning considering the fact that you've been listening primarily to us boring bureaucrats. As a matter of fact, when Dave Collett was telling the story about the speech he had to give, and in relating it to Elizabeth Taylor's seventh husband, that reminded me of the chap that introduced me one time for a speech I gave here in Corner Brook some time ago.

The master of ceremonies said, "I'm not going to give you a long-winded and boring speech, but I'd like to introduce the man who will". It was all down hill from there as you can probably appreciate.

This morning has been fairly interesting. Thank you for your forbearance. I know what it is like to have to sit in a conference atmosphere--the bright lights and the hard chairs--but I think we've probably gotten a good overview from at least three of the major players in the energy business.

This afternoon we're going to hear from the Department of Rural, Agricultural and Northern Development, and perhaps from Martin Lowe we'll get an idea of how that department feels about the energy field, and perhaps we'll get the input of the development associations and some of the community councils themselves.

Martin Lowe, Department of Rural, Agricultural
and Northern Development

One of the things that I was asked to do today, and that I will attempt to do, is to try to inform you about just what this whole community development business is all about, what the development association process is, and how the Department of Rural, Agricultural and Northern Development fits into that process.* All through my address I hope to highlight the very important contribution that volunteers through those development associations are making today all over Newfoundland.

Just about every community in rural Newfoundland is represented by a development association. There are 54 such associations which come under the umbrella organization, The Newfoundland and Labrador Rural Development Council.

The associations have their beginnings in the early 1960s. The association movement was viewed in some quarters as being a radical movement because of their potential for acting as an outlet for dissension. One of the biggest problems we had in setting up development associations was to convince government that organizing local people was not a threat to the status quo. Today, and this conference attests to what I'm about to say, there is excellent co-operation between the development associations, the Rural Development Council and the various government departments they work with.

In the Smallwood years, the first amount of money was given to development associations to help with administration costs. The new government of Premier Frank Moores created, in 1972, the Department of Rural Development. This was in direct response to the ever growing rural development movement. That department, in 1973, negotiated a five-year federal/provincial rural development agreement which provided administration grants to the development associations.

At the time I think the administration grants were $12,000. In 1978 to 1983, a second rural development subsidiary agreement was signed that gave the associations at that time, administration grants of $16,000 per year. In 1984, a third rural development agreement was signed, giving administration grants of $26,500 to each development association in the province.

The next question is, "If you're going to give the associations money, what controls do you have?". Do we as civil servants and as a government, control what the associations can do? The answer to that is no. Funding is not a control mechanism.

As a member of the Division of Regional Development, part of a much larger department, my job is to assist the development associations in their day-to-day administration. We respond to development associations when they ask for our assistance. We do not impose our departmental policies, our departmental will, on them. The only imposition that we apply is that in as much as the development associations are using public funds, we ask for an accounting of those funds.

What is the future of the development associations? What's the next step? What happens if the government withdraws their funding? Will the associations founder?

There are 54 development associations today doing a lot of work around the province, work that could never be done by government or private industry. So what happens if funding ceases for that? Are the associations working towards long-term viability? The answer is yes. The members of the associations are seeking ways to create a climate whereby if government funding is withdrawn, I don't think very many development associations will disappear.

If that happens...the funding in place is a great boost and a great asset to the associations and I'd like to see that funding continued. But if there came a time when that funding was discontinued I'm sure that 99% of the associations would carry on and would still have a major influence on the character of rural Newfoundland.

There are nearly 2000 people who sit down every month at development association meetings, community meetings, and public forums, to plan projects that will enhance the economic and social viability of rural communities. It's through the efforts of local people, identifying local needs, that you have projects like the St. Shott's peat project and the biomass project in the Roddickton area. It is these types of projects that will lead to job creation and stable economic conditions. We can't rely totally on the fishery anymore. There have to be other alternatives.

I often hear the criticism that development associations are just sponsors of make-work projects--delivery boys for stamps. That is so far from the truth. Associations do get involved in a lot of short-term projects but only in response to the needs of the people within the area they service. If an organization has the ability to access funds, to help a next door neighbour to have a bit of cash, is there something demeaning about that? Development associations will continue to be involved in short-term projects, but are moving more and more towards long-term objectives.

With the spirit of co-operation that exists between the development associations, the various federal and provincial agencies, and private industry, through the efforts of the hundreds of community-minded volunteers who make up the development associations, I am confident in predicting that rural communities will maintain their viability.

* The film, "Development Associations in Newfoundland", was shown as part of Mr. Lowe's address. Inquiries regarding the film should be directed to the Department of Rural, Agricultural and Northern Development.

Nat French

Just to follow up on Martin Lowe's words, in this particular program (the RCDP) we've dealt with development associations across the province, always in the case where they are key players. I need only cite the Southern Avalon Development Association and the St. Shott's peat project as an example. At Bay

D'Espoir the development association was a prime mover behind the fish hatchery there, utilizing waste heat recovered off Hydro's turbines. In White Bay Central, the development association initiated the first feasibility study for the Roddickton biomass project. On the east shore of Labrador, the development association initiated studies in Port Hope Simpson involving the recovery of waste heat from the diesel generators there.

The Rural Development Council itself, through the good graces of Tony Collins, agreed to sponsor and participate in two of the major studies that we did under the RCDP: the IDP Conservation Potential Study and the Highlands Northern Development Biomass Study.

As you can see, our involvement with the development associations has been quite extensive and I'm sure Hydro and the Department of Mines and Energy and all the other players in the game can say exactly the same thing.

Introduction

Nat French, Conference Chairman

Our next speaker is Mr. Gordon MacDonald of the Public Utilities Board. He's been chairman of the board since 1979. The type of work he's presently engaged in is regulatory, but included in his past is a stint from 1974 to 1979, as the Deputy Minister, Department of Transportation.

Gordon MacDonald, Chairman of the Board
Public Utilities Commission

I'd like to extend my thanks to the organizers of the conference for inviting me to attend and to say a few words about the Public Utilities Board. I'll take this opportunity to give the background of the Public Utilities Board. As of late, there seems to be a general misunderstanding of the duties and functions of the Public Utilities Board (P.U.B.).

The P.U.B. was created in 1949 by the passage of the Public Utilities Act. It has functioned under that Act ever since. The Act gives the Lieutenant Governor in Council the right to appoint the chairman, commissioners and the clerk. All of these, with the exception of the clerk--subject to good behaviour--are appointed until retirement or the age of 70, whichever comes first. Their function is to administer the act which created them. At the present time the P.U.B. has six commissioners including two vice-chairmen, and myself, as chairman.

Since the proclamation of the Public Utilities Act, the P.U.B. has been assigned the responsibility of five other Acts:* the Public Utilities Acquisition of Land Act, the Electrical Power Control Act, the Motor Carrier Act, the Motor Vehicle Transport Act of Canada, and a portion of the Automobile Insurance Act. A sixth act, the Ferries Act, was repealed in December 1983.

In its role of administering these Acts, the Board's functions can be classified in three categories: legislative, judicial and administrative. Because of its functions the Board is sometimes referred to as a quasi-judicial body. The Board acts in a legislative capacity when it prescribes a rate at which a public utility or motor carrier may charge the public for a service. The Board also acts in a legislative capacity when it prescribes rules and regulations for purposes of implementing the legislation under which it operates.

* The five Acts mentioned are available from the provincial government.

Section 18 of the Public Utilities Act reads:

> The Board may, from time to time, revoke and alter rules and regulations for the effectual execution of its duties and of objects of this Act. The regulations of this practice and procedure, with regard to matters over which it has jurisdiction, and such rules and regulations when approved by the Lieutenant-Governor in Council, shall have the force of law.

The Board also acts judiciously when making decisions concerning the reasonableness of existing and proposed rates of public utilities and motor carriers, when making decisions on applications from public utilities to expropriate property, when hearing service complaints from customers, and when hearing evidence at formal public hearings.

The Board acts in an administrative capacity when discharging its duty to enforce the provisions of the Public Utilities Act and other Acts and in seeing that its decisions and orders are carried out in prescribing systems of accounts for the various utilities it regulates, and in receiving and studying regular reports from the utilities under its jurisdiction.

In the exercise of its function the Board is autonomous, with the following exceptions: 1) an appeal to the Supreme Court, Court of Appeal, for any order of the Board on any question concerning its jurisdiction, or upon any question of law, 2) awards of compensation in excess of $5000 under the Public Utilities Acquisition of Land Act are prior to subject approval of the Lieutenant Governor in Council, and 3) regulations made under section 18 of the Public Utilities Act and Section 27 of the Motor Carrier Act, are submitted to the Lieutenant-Governor in Council through the Minister of Justice for approval.

The salaries of the members of the Board and that of the clerk are determined by the Lieutenant-Governor in Council. The Board is empowered to, and does, employ its own staff and fix their salaries. It also retains outside expertise including its legal council, engineers, accountants, and any other expertise that is so required.

Although the Board is created by government it was not designated as an agent of government. The Board is self-supporting in that it generates its own funds by way of an assessment to the public utilities and insurance companies, by charging fees for certificates and licences to motor carriers, by charging for the conducting of public hearings, by the collection of fines for violation of the conditions of a certificate or licence, and other various small fees.

The budget for the P.U.B. in 1985 was approximately $1.25 million, 60% of which was paid out in salaries and disbursements for other expertise. The Board employs 28 people. This number includes Board members but does not include those retained under contract.

Although the public sometime appears to have the impression that the P.U.B.'s main function is to increase electricity and telephone rates, the Board's actual functions are more diversified. If you were to assign the Board's time and effort to each of the Acts it administers, it would be something like this: approximately 50% to the Motor Carrier Act and the Motor Vehicle Transport Act, approximately 40% to the Public Utilities Act, the Public Utilities Acquisition of Land Act and the Electrical Power Control Act, and approximately 10% to the Automobile Insurance Act.

Although the Board spends the majority of its time and efforts administering the Motor Carrier Act, and the Motor Vehicle Transport Act, the Acts that appear to have a higher profile with the public are the Public Utilities Act and the Electrical Power Control Act.

Under the Public Utilities Act, the Board fully regulates Newfoundland Light and Power Company Limited, Newfoundland Telephone Company Limited, Deer Lake Power Company Limited and, by agreement, the Iron Ore Company of Canada. Since this conference is related to energy I'll refer only to Newfoundland Light and Power as a public utility fully regulated.

The Public Utilities Act gives the Board the responsibility to ensure that every public utility shall furnish service and facilities reasonably safe and adequate, and in all other respects just and reasonable. It also details other duties and responsibilities that the Board must undertake. For example, in the case of an electric utility, what the proper voltage and frequencies of it shall be, what the limit of the maximum variation in voltage shall be, when and where they remove power, where they must supply power, what reports all utilities shall furnish to the Board, the manner in which all utilities must apply to the Board to issue shares, stocks, bonds, debentures, any evidence of its indebtedness, and many other details.

It is also quite clearly stated in the Public Utilities Act, that every public utility is entitled to earn annually, a just and reasonable return as determined by the Board on the rate-base fixed by the Board. That return shall be in addition to such expenses as the Board may allow as reasonable and prudent and properly charged to the operating account.

What I have said boils down to this: the Board has a responsibility to the public, to the consumer, the ratepayer, as well as to the utilities it regulates.

As I mentioned at the beginning, under the Public Utilities Act the Board regulates Newfoundland Light and Power as well as the Deer Lake Power Company and the Iron Ore Company. The Electrical Power Control Act is somewhat different from the Public Utilities Act. It describes the policy of the province that must be considered by the Board. For example, it requires that Hydro recover its cost of service plus a margin of profit to enable it to achieve and maintain a sound credit rating in the financial markets of the world. The requirement for the PDD on the other hand, is to only recover the cost of service provided by it taking into consideration any subsidies that are or may be payable by the crown.

The Electrical Power Control Act also requires that Hydro or the PDD, refer any proposal to alter rates to the Board, and the Act then directs that the Board hold a public hearing on the proposal. The hearing procedures that result are carried out in a similar manner to those held as the result of a request from any other public utility made under the Public Utilities Act. Evidence must be submitted--interventions or statements of opinion are encouraged--and all evidence must be attested and witnesses cross-examined. Sworn evidence is not mandatory in the case of a hearing under the Electrical Power Control Act. A witness can give information only. The Board carries out its own investigations. At the conclusion of the hearing, the Board must, after analysis of evidence and a summary of information, make a report including its recommendations to the Minister of Mines and Energy. The Minister will then refer the matter to the Lieutenant-Governor in Council which body may then approve the rates recommended by the Board or any other rates. The Lieutenant Governor in Council has 15 days after submission of the report to approve or change the recommendations. Failing that, the recommendations in the report will apply.

At a hearing as a result of a proposal from the PDD to alter rates, it's practically the same process with the exception that the Lieutenant-Governor in Council is not obligated to act within 15 days of receiving the Board's report.

This background is given so that you may understand the Board's function and appreciate the various problems that would face the Board if one of the projects you are talking about today were to be developed, and the Board requested to set rates for the power produced by that project. Since we're dealing with hypothetical situations, I'll explain what would happen if such a situation were to occur.

If a private enterprise were to develop one of the many projects discussed here, that private enterprise would, in all likelihood, become a public utility and as such would be governed by the Public Utilities Act. A public utility is described as follows: a person, firm or corporation who now or hereafter, owns, operates, manages or controls in this province, equipment or facilities for the production, generation, storage, transmission, delivery or furnishing of electrical power or energy, water, or heat, either directly or indirectly, to or for the public or any corporation for compensation.

That being the case, the new entity, called a public utility, would have to apply to the Board to set rates and the Board would of necessity call a public hearing on the matter. At that hearing, evidence would be produced to show what the capital costs were, what the operating expenses would be, and what the public utility would have to charge in its rates to recover its expenses and realize a reasonable rate of return for its investment.

Since any of the projects described at this conference apply only to communities that are off the electrical grid, and there can be no consolidation of expenses, the full cost of this particular development scenario would flow through and be reflected in the rates. I suspect that the resultant rates would be very expensive if not prohibitively so. Further, in this scenario the ratepayers availing of the electricity would have to pay the full shot.

Another scenario might be where a government agency such as Hydro or the PDD were to develop one of the alternative energy systems, but wished to set rates different from those now in existence. They would also have to refer their proposal to the Board and go through the same public hearing process. However, a major difference could now arise and that would proceed from the differences in the Acts I mentioned--that there's a provision in the Electric Power Control Act that rates could be set by the Board, taking into account any subsidies that are or may be payable by the Crown. In other words, government may, if it chooses to do so, subsidize a ratepayer in a particular area by charging less than the cost of generating that power. In such a case it would be the taxpayers of Newfoundland who would pay the cost and not just the ratepayers in the particular area. There's no free lunch. Somebody has got to pay the cost of service for any development that goes on.

The PDD's operation at the present time is very heavily subsidized by government so that all areas of Newfoundland are paying approximately the same rate for the same class of power. I realize there are two distinct rates--one for the interconnect area and one for the isolated or diesel areas. Even so, the rates charged by the PDD do not necessarily reflect the total cost of supplying power.

In neither of these scenarios do I go into the technical problems that could exist since technical problems are beyond the expertise of the Board. But it is assumed that such problems as might arise in supplying firm power, would be considered by the Board.

A third scenario would have a public utility operate under the Public Utilities Act but be exempt from various conditions of the Act. Under Section 74, the Board may, by agreement, exempt a corporation that supplies power coincidental to its primary operation. The rates would then be set in an abitrary fashion. This was done by the Board in 1965 for the towns of Labrador City and Wabush where IOC supplied power in Labrador City and Wabush Mines supplied power in Wabush. The situation worked very well, on the whole, for a long time. Problems did arise in the town of Wabush but those problems seem to have been resolved. Such an agreement is not beyond the realm of possiblity where a fish plant determines that it should supply power to others from a supply that was developed for the fish plant. However, it would appear that such a situation would come under the heading eligible applicants which identifies companies in, for example forestry and mining, that maintain eligible communities as part of their operation.

I hope this information gives you some insight into the operations of the Public Utilities Board. Since the Board views the public utilities in retrospect, even though they allow for a future test year, their perspective as shown to the Board may not be as constructive as some others who are looking at it from a more forward angle.

Nat French, Conference Chairman

Thank you Mr. MacDonald. I'm sure what you have given us this afternoon is going to provide fodder for the question period.

Question and Answer Period - Day 1 Speakers

Introduction

Nat French, Conference Chairman

What we've had so far is an overview of the provincial and federal governments' positions vis-a-vis remote communities; some of the things they'd like to do and some of the things they have done. We've heard from Martin Lowe about community development, Mr. MacDonald from the Public Utilities Commission, Elliot Rodger from EMR, Ottawa; Philip Graham from the provincial Department of Mines and Energy, Dave Collett from Newfoundland and Labrador Hydro, and Graham French, EMR.

This is your opportunity to pursue some of the issues our speakers raised. For example, I understood from Mr. Collett's comments this morning, that if there was a private company or municipality interested in developing their own generating facility, arrangements could be made for Hydro to purchase the power provided the interconnection was a safe and tested one. Some people expressed the impression that Hydro was closing the door on such developments. This is one area that some of you may wish to pursue.

The fact that such companies would be subject to the regulations of the Public Utilities Board may be an area that some of you would like to investigate. The floor is open.

Question

Dave Stewart, Provincial Consultants

Mr. Collett and Mr. MacDonald, I understand now that we have a very heavily subsidized rate of energy. A private developer doesn't have the benefit of that subsidy for any development he undertakes. He has to charge the full rate to recover his costs. Consequently, a private developer of a mini-hydro project could never compete because a mini-hydro would be more expensive than the five or six cents per kilowatt hour he's allowed to recover in the first 500 kilowatt hours supplied. In light of that, would a private developer going in to reduce your subsidy be the most appropriate approach to take?

Answer

Dave Collett, Newfoundland and Labrador Hydro

For the utility to be interested it has to be cost-effective for Hydro to purchase power from the developer. To satisfy that requirement it obviously means the developer's price has got to be lower than Hydro's costs at that time. If buying power from the private developer lowers the costs of our the total PDD operation, that's all it does--lowers the cost of the subsidy. It doesn't change the rate structure.

Answer

Gordon MacDonald, Public Utilities Commission

Presumably your hypothetical developer would be coming in to the Board to have a rate established for the power he wants to sell. He'd want to recover his full costs and he'd also want to make a profit. He would then propose to the Board that he would charge such-and-such based on evidence of his expenses. If he could prove to the Board that his expenses were prudent and reasonable, the only discretionary power the Board would have at that time would be to establish the rate of return on his investment.

Question

Dave Stewart, Provincial Consultants

If a private developer could generate electricity for less than Hydro's costs, then would Hydro be interested in pursuing negotiations? The developer would know that if it cost Hydro 20 cents per kilowatt hour to generate power for the same area, and Hydro's only recovering six cents per kilowatt hour, as long as the private developer can produce power for less than 20 cents, would Hydro be interested in negotiating?

Answer

Dave Collett, Newfoundland and Labrador Hydro

We could certainly start negotiations anyway.

Question

Bryon Bates, Galt Energy Systems

One of the major restrictions on private developers is the capital cost of small hydro units. To encourage developers there has to be a good return on the money they invest. In order to do that, developers have to know what the revenue will be ahead of time. Is there any thought to setting a provincial formula or pricing policy so that each developer does not have to go the P.U.B. to have rates set after the fact?

Answer

Dave Collett, Newfoundland and Labrador Hydro

Let's assume you're putting a mini-hydro installation in a diesel-supplied community. The rates in all the diesel communities are the same regardless of the actual cost of producing a kilowatt hour. I really don't think that we can set a policy that would give you any guideline as to the price that you could charge. Obviously if you're looking at Cartwright it's one price that makes us (Hydro) interested, and if you're looking at Roddickton it's another price.

Question

Bryon Bates, Galt Energy Systems

You say there are the same rates in every community. Are you talking about the rates that the P.U.B. sets, or the real cost of supplying power? I understand that it does cost more to transport fuel to some communities. All I'm suggesting is perhaps some sort of formula for calculating revenue based on real costs.

Answer

David Collett, Newfoundland and Labrador Hydro

When I say that the rates are the same in every community I'm talking about the rate to the domestic consumer. The same structure applies in every diesel-supplied community. The cost of Hydro's providing that service differs for every community, depending on location, number of customers, and size of the installation.

Comment

Bryon Bates, Galt Energy Systems

I guess what I'm talking about is the real cost of providing power to a community.

Comment

Dave Collett, Newfoundland and Labrador Hydro

I think Hydro could probably develop guidelines as to what makes it attractive from Hydro's point of view, and that might then be considered when the P.U.B. sets rates.

Comment

Bryon Bates, Galt Energy Systems

That would be most helpful to the investment community; breaking down one of the barriers, which is the capital cost of investing in one of these energy projects.

Comment

Dave Collett, Newfoundland and Labrador Hydro

If you can get those capital costs down, I say to you as a manufacturer, that's the key to making these mini-hydro sites attractive.

Comment

Bryon Bates, Galt Energy Systems

Just to give an example, we are doing an installation now in Ontario, which is not a remote installation. The rate at which we are selling the power to Ontario Hydro is a maximum of 3.3 cents. The investment capital comes from private sources. The money that has been raised is over $1 million and we are returning a profit to those investors. The installation was a good one. There were a lot of facilities in place. I think that cost estimates have to be site-specific. But in order to arrive at those costs we have to know if it's feasible to do it in the first place and that's where revenue comes in. Some formula for revenue calculation would be most helpful.

Comment

Dave Collett, Newfoundland and Labrador Hydro

I appreciate what you're saying.

Question

Bob Holmes, Holmes Engineering

I'm also interested in costs. But I'd also be interested in some commentary on the need for planning of small-scale hydro projects. Are there any community plans or municipal plans that would integrate the benefits of a combined water supply with mini-hydro? Where are we in the province with respect to integrated planning at the community level?

Answer

Graham French, EMR

It's fair to say that for the province as a whole we have not been witness to much integrated planning. There are exceptions to that. Rigolet is an example. We worked very closely with Municipal Affairs in studying the possibility of installing a mini-hydro plant there. Mary's Harbour is another example. In cases that have been identified--which almost has to take place on a case-by-case basis--integrated planning has been pursued. But in terms of doing it as a matter of course in all cases, I haven't seen that philosophy evident.

Question

Bob Holmes, Holmes Engineering

Where does it have to start? Does it start at the community planning level? Who should be the main mover in implementing such a philosophy?

Answer

Graham French, EMR

The spark has to come from the communities. They know their needs best. They're familiar with all the specifics of their communities. Their communities are where all the planning comes into focus--the planning for their water supply, other community services, as well as their supply of energy.

Comment

Nat French, Conference Chairman

In a couple of cases where we've done studies with Municipal Affairs, we've looked at the feasibility of using the municipal water-supply systems jointly with a low-head hydro project in order to find some common cost reduction.

Comment

John Evans, Newfoundland Light and Power

We operate 22 small hydro plants throughout the island portion of the province and in most of these locations the local community uses the same water for their domestic supply. In our case, the towns have usually come along after the fact and utilized the storage facilities after we've had everything in place. The uses are somewhat complementary so there's obviously ground for give and take, for co-operation and cost sharing. I don't see why the two can't be planned together.

Question

Nat French, Conference Chairman

Does it work in reverse? If it's the water supply system that's in place is it feasible to put in a low-head hydro project or a mini-hydro? I think that may be the concern at the base of Mr. Holme's question, especially in light of the fact that some communities on the Labrador coast are now getting municipal water supply systems under various federal/provincial agreements.

Answer

John Evans, Newfoundland Light and Power

I think it would be feasible given that these communities require a very small amount of water for their domestic water supply. They wouldn't need to be concerned about the head if the lake or pond is higher than the community, thereby eliminating the need for storage reservoirs. However, it takes a lot of water to generate a few kilowatt hours. You may have to have a more intricate system for the hydro plant than for the town water supply. It's probably simpler the other way around.

Comment

Tom Beresford, Department of Municipal Affairs and Housing

The flow for a town of about 600 people would be an average of 50 or 60 gallons per minute. As Mr. Evans pointed out, when you're looking at a power project you're looking at much greater flows. However, there are examples of combined use--the town of Deer Lake for instance. The powerhouse at Deer Lake is in a canal which feeds into a penstock and the town just taps its water from the penstock. In that way both parties have a reliable water supply.

Comment

George Sturge, Newfoundland and Labrador Hydro

As a prelude to my presentation scheduled for tomorrow, the size of the dam required at Mary's Harbour was considerably greater than what was required for the water supply. We're talking about a concrete dam that's something like 3 metres higher and the penstock 1.2 metres whereas we required something less than a third of a metre for the water supply. The size of the facilities are quite different.

Question

Nat French, Conference Chairman

I understand there were common features of the system that could be used in the development of the project. Is that correct?

Answer

George Sturge, Newfoundland and Labrador Hydro

Yes. If we had had to go in there and develop the same size unit without the water supply, we'd have been talking costs of a little over $3 million. Incorporating the water supply and utilizing common facilities, the incremental cost of adding the hydro was $2.5 million, so we're looking at a savings of something in the neighbourhood of a $.5 million.

Question

George Osmond, EMR

Assume there was a small hydro project in a remote area and resulting from that would be savings in generation of electricity, and therefore a reduction in the subsidy required by your company. Would that savings filter down? Would the communities realize cheaper energy rates?

Answer

Dave Collett, Newfoundland and Labrador Hydro

No. The savings that Hydro and PDD would achieve through buying power from your hypothetical development, would obviously go to reducing the subsidy. The rate structure is still not sufficient to make that red ink black. It would not result in a lowering of rates for those communities.

Question

Bill Buggie, Department of Forest Resources and Lands

Mr. Collett, two months ago a company started up two 25-megawatt wood-fired generating stations in Maine. They also have some of these plants in California. Has Hydro ever considered this system? If another party wanted to come into Newfoundland and propose it, would you be receptive to the idea?

Answer

Dave Collett, Newfoundland and Labrador Hydro

As most people know, Hydro has been involved in a study of the utilization of biomass at Roddickton. The results of the feasibility work that's been done to date are quite encouraging to us purely from the point of view of generating electricity. We are looking at going to a further stage of feasibility work early in 1986. If all the indications of an advanced study are positive, we could be looking at going ahead to actually doing an installation--much smaller than 25 megawatts obviously because of the size of the Roddickton system. We're looking at something nearer one megawatt.

If somebody else wanted to do it, providing the technical considerations were right, the cost information was right and they did the other things required of them by the P.U.B., we'd be interested buyers of the energy provided it was cost effective.

Question

Unidentified

We realize there's going to be an energy shortfall in five year's time. I know you're looking at expanding at Holyrood if you don't get an interconnect at Labrador. Is a biomass-fired, 25-megawatt station, or something along the lines of a large, biomass thermal system being evaluated as an option?

Answer

Dave Collett, Newfoundland and Labrador Hydro

No, it's not being evaluated seriously. That's not to say that we wouldn't do so if biomass were proven to be technically suitable and cost effective. The point is, the quantities of capacity and the energy capability that we're looking at for the island interconnected grid five to six years down the road, are in the 150-megawatt and higher range. We're not aware of a viable biomass alternative in that capacity size right now.

Question

Dave Stewart, Provincial Consultants

I realize that you are doing an in-house evaluation for waste heat. Have you established a rate for waste heat?

Answer

Dave Collett, Newfoundland and Labrador Hydro

No, we haven't. We've just started an in-house look at this and we really haven't yet come to any definitive answers.

Question

Janet Skinner, Norman Bay, Labrador

If a group of people are sharing power in a co-operative fashion in either summer fishing stations or in their communities, I was a little bit worried that they'd have to be licensed if they were going to charge. Could you define where the borderline occurs between charging people as a company or a group, and co-operative use of power? What would the licensing requirements be?

Answer

Gordon MacDonald, Public Utilities Commission

To be precise you'd have to go to the definition of utility under the Act. We set rates. If you're not going to charge what would you be coming to us for? I've never been approached with that situation before so I don't how to deal with it. If you charge you are a public utility. If you don't charge then you are not.

Question

Janet Skinner, Norman Bay, Labrador

For example, if one of the gentlemen with a wind turbine agreed to provide a community with power for a summer fishing structure, and there was an agreement between say six fishing crews to share that power, and they agreed on a rate and signed a contract amongst themselves, then one decided not to pay, would that be cause for the P.U.B. to intervene?

Answer

Gordon MacDonald, Public Utilities Commission

You're hypothesizing that six people get together to form a group to supply power to themselves? My opinion is that they are not a public utility. If it is a private agreement that one reneged on I think perhaps it would be a legal matter. I don't think we'd have any jurisdiction over that.

Question

Bryon Bates, Galt Energy Systems

Someone suggested that a mini-hydro project would be viable only if it had a payback of four to six years. How was that payback period calculated? I'd beg to differ with the individual that made the comment.

Answer

Philip Graham, Department of Mines and Energy (Prov.)

I was using that payback period in the context of a global analysis for all renewables and conservation measures. It wasn't specifically for hydro.

Comment

Bryon Bates, Galt Energy Systems

For a small hydro unit you're talking about a 30- to 50-year life and normally a four- to six-year payback is extremely good for a small hydro installation, indeed for any hydro installation. I'm confident that Mr. Collett would concur with that that their amortization periods are far in excess of that. I just didn't want to leave anybody with the impression that you had to have a four- to six-year payback in order to justify putting in an energy resource unit.

Question

Craig Toepfer, Earth Energy Systems Ltd.

I can easily visualize where the cost of complying with the technical and reliability requirements of the power company, and gaining approval from the P.U.B. for a small-scale community demonstration project could be significant, when compared to the cost of the equipment or actually providing power. Is there any means of streamlining the process to minimize those costs for a private developer who wishes to demonstrate a system?

Answer

Gordon MacDonald, Public Utilities Commission

Yes. If you were going to provide a demonstration and not a permanent structure where you wanted to fix long-term costs or long-term prices. I would guess that the P.U.B. would ignore such a situation until such time as it became a permanent sturcture.

Comment

Dave Collett, Newfoundland and Labrador Hydro

While we're on the topic, some people may have gotten the impression, based on my address of this morning, that Hydro would be very difficult to deal with on the application of alternative energy sources and possible sale of power to Hydro. In fact, the impression that I wanted to leave, is that if it helps Hydro to reduce its power costs, Hydro is interested. There's no question about that. But we do have concerns for the technical considerations vis-a-vis tie-in and the availability of power. That doesn't mean that we're attempting to create a bottleneck of regulations before you can come talk to us. We do have criteria that must be met but they're not that difficult.

Comment

John Evans, Newfoundland Light and Power

I would suggest that for the small-scale renewable, or non-renewable energy projects, you will find that it's not the utilities or the P.U.B. or those kinds of regulatory authorities that give you all of the headaches and problems, but an environmental approval process that doesn't differentiate between micro-, mini- and mega-projects. They require the same justification, the same analyses for all of these projects. On a billion dollar project it might not appear to be very significant to spend $.5 million dollars on an environmental assessment. But on a million dollar project, an environmental assessment would probably cost just as much. That is the real deterrent to small renewable energy projects.

Question

Terry Nippard, Department of Rural, Agricultural and Northern Development

This conference makes me realize how much invaluable information is available. Unfortunately, that information is not making its way into the hands of all the people who need it most. I'm thinking particularly of very isolated communities. I think there

are many people in those isolated communities who would have liked to have been party to this conference and the information coming out of it. Unfortunately, by the time notice of this gathering reached them it was too late. Could priority be given to communicating with those people in the future?

Answer

Graham French, EMR

An effort was made prior to this conference to forward notice of the conference to all the contacts we had available. We regret if anyone was overlooked and we'll make every effort to communicate with them in the future.

Comment

Terry Nippard, Department of Rural, Agricultural and Northern Development

I know that the information got to me and I'm in one of the more isolated communities. What I'm referring to specifically is general information, not just information pertinent to this conference. I would like to have been more aware of developments that have occurred leading up to this conference. I feel I could have been a more informed representative. One of the biggest factors in development in coastal Labrador is exposure and education.

Comment

Graham French, EMR

I hope that this conference will be a start to the promotion of the kind of information you're talking about, and that we'll do a whole lot more.

Question

Elliot Rodger, EMR

Are you after more technical information on energy supply and conservation options Mr. Nippard?

Answer

Terry Nippard, Department of Rural, Agricultural and Northern Development

Yes.

Comment

Elliot Rodger, EMR

Speaking on behalf of EMR, we've been pretty busy in the last couple of years, and the last six months in particular, trying to get some studies done, both the overview studies and specific studies. During the next few years Nat French, Graham French and Paul Duffett will be having much more contact with the communities under the RCDP to get you the information you're looking for. We're going to try to hit all the communities with print and audio-visual material.

Communities with known options or really promising options either for alternative supply or for conservation measures will be considered as priorities.

Comment

Nat French, Conference Chairman

The purpose of this conference is information transfer. I wouldn't want any of the participants to prejudge the conference before we're even out of the first day. Tomorrow we'll get into the presentations on the feasibility studies that were done and on day three, when we get into the workshops, that will be informative. For us this is just the start of the information transfer process.

Comment

Janet Skinner, Norman Bay, Labrador

The kind of problem Terry Nippard spoke of often happens because remote communities are developing on almost three levels. With the rural development movement we've got a sort of middle administrative level composed of all the radicals who are changing to bureaucrats and becoming knowledgeable because they're on the board of directors of development associations or on committees. Then we've got people like yourselves at the top. Then there are rest of us who sometimes don't organize well enough to access your information. That's probably where a lot of people from our communities are right now. We don't come to you to ask because we're not sure about how to ask or because we're a little shy or for whatever reasons. Then when we're not on your mailing list we don't get invited. That's not a complaint, it's just a statement. There's a whole other level there that needs to be churned up. We need to develop better two-way communication.

Comment

Nat French, Conference Chairman

I fully appreciate what you're saying. We're attempting to get to know all the players in the game at the community level. It takes time and we do miss some people. We are trying to work the rural development council approach as well. They sit on our regional advisory committee. We're trying to cover all the options.

Question

Dave Stewart, Provincial Consultants

There's never really been a gathering of information from the last five year's worth of conservation and renewable energy programs, especially within the context of a national perspective. Is there an effort in Ottawa now to bring together all the information of the last five years, and to make it available to the remote communities, to the consulting community and any other interested parties?

Answer

Elliot Rodger, EMR

Yes, for work done under the RCDP. I can't speak for the CREDA people. That program has been disbanded. What we are doing right now under the RCDP is looking at information that has come out of alternative energy supply and conservation projects that have taken place, regardless of whether they've worked or not. We're looking at what's been done under CREDA, under EnerDemo, and work that's been done by provincial and territorial governments; we're looking at the whole information base. We're packaging it for the remote community clientele.

We have categorized the information into nine priority areas ranging from energy efficient and safe use of wood in houses and institutions vis-a-vis wood stoves and wood boilers, to manual type affairs on wind, hydro, and biomass power generation systems, to the efficient use of diesel generators to save oil and use waste heat. The information is being tailored to our power-specific targets which are the remote communities clientele.

Question

Dave Stewart, Provincial Consultants

Is the agency responsible for EnerDemo doing the same thing for that program? I'm suggesting that we bring all the information from these related programs together, so that we can see what did or didn't work within a national perspective.

Answer

Elliot Rodger, EMR

Yes. That sort of thing is being done as a result of the CREDA and the EnerDemo Canada programs, but the information is being tailored for the audiences that are particular to each program. The RCDP is using the print medium--specifically studies such as those contained in the RCDP information binder--but it's also trying to use other approaches such as personal contact, community presentations, conferences, workshops, and seminars. We'll also be utilizing video material. We're trying to take a more personalized approach under the RCDP.

Comment

Graham French, EMR

I'm not sure if this perception exists or not but I'm going to put it to bed if it does. I don't know if there's a sense that community members are johnny-come-latelies to this process, because they certainly are not. Most of this work wasn't completed until this past summer. It takes a while to get it all together and digested to a point where we really have something important to say. This information transfer process is only starting. It's going to take a number of years.

Comment

Philip Graham, Department of Mines and Energy

The Department of Mines and Energy is also keenly interested in spreading the word about energy conservation and renewables. It does take a long time to get this information prepared. Having worked on the CREDA program for five years, it's really only now that much of that information is ready for dissemination.

Comment

Elliot Rodger, EMR

Those of you who have access to the RCDP studies summary...the point of the binder is for you to read the summaries. They're only two or three pages long. If you find that a study relates very particularly to an interest of yours, the full study is available and there's no charge for it and you should contact EMR to get copies.

Question

Bob Holmes, Holmes Engineering

My question concerns provincial strategy concerning conversion to electric heat. In view of the rising costs of electrical energy, is it a provincial strategy to encourage the conversion from oil to electric heating?

Answer

Philip Graham, Department of Mines and Energy

No, it isn't a provincial priority to make conversions from oil to electricity because what it means is that increased generation from Holyrood, which is an oil-fired generator, would be required. That may change at such time as there is a large supply of electricity available from Labrador.

Question

Tom Beresford, Department of Municipal Affairs and Housing

Has any thought been given to increasing the energy independence of industries in remote communities by making charcoal out of their wood supplies? Transporting wood is relatively expensive. Charcoal is only one-third the weight of wood and you could probably transport it three times the distance for the same cost. I understand that you can make charcoal just by roasting the wood and distilling off the by-products.

Answer

Nat French, Conference Chairman

I'm not aware of any work of that nature that has been done in the province.

Comment

John Evans, Newfoundland Light and Power

I'm just a little bit concerned about Phil Graham's comment about energy policy, more as it pertains to the island area than as it pertains to remote communities. The suggestion is that at present the policy is not to encourage electrical energy consumption but the policy may change, in what I gather to be the not too distant future, if in fact Labrador power became a reality. I would think if we are working towards an interconnection with Labrador the policy would be to encourage--but not abuse--conversion.

I'm not suggesting that we not do it wisely and efficiently and take every possible measure to conserve, but if in the long term we're going to have that form of energy, then maybe it's not wise to encourage the use some other form of energy in the short term. From a policy perspective, we have to make our decisions based on a long-term view.

Answer

Philip Graham, Department of Mines and Energy

I suppose I should qualify my remarks. I'm not really a policy maker. I know that when we were working out guidelines for previous programs, electrical conversions were not favoured. They didn't qualify for grants under the Alternative Energy Conservation Investment Program (AECIP). As far as the long term goes, Mr. Evans is quite correct. The long-term view is the one we need to take. But assuming the power from Labrador was in place, I wonder how long it would take to expedite conversion? Through the use of incentives and by encouraging people to convert, I think it could be done very quickly. The same could be true of industrial users.

Comment

Dave Collett, Newfoundland and Labrador Hydro

It's something of a chicken-and-egg story. The price structure sends the correct signal to the consumer, determining whether he goes with electricity or oil. What I think I hear you saying is if the use of electricity is encouraged and a higher load demand created, that may promote the possibility of a Labrador interconnection. However, I think a more conventional approach is to develop the rate structure around the costs of the system. That would no doubt signal the consumer that electric heat is the avenue to explore.

Comment

Nat French, Conference Chairman

There are decisions that the homeowner makes as well, especially in terms of new home construction. The initial cost of electrical resistance heating is a lot lower than some other forms of heating.

Comment

Philip Graham, Department of Mines and Energy

There is one method that gives you the best of both worlds. It's the type of heating system that uses both electricity and oil. The electricity would provide the base load for your house and the oil would come on in the coldest weather. That way there would be a limit to the amount of electricity used. Such a system also provides benefits for the utility in that they would experience fewer load peaks.

Thursday, November 28, 1985

Nat French, Conference Chairman

Good morning. Paul Duffett administered, organized, and ran the RCDP in the St. John's office. Consequently, Paul is intimately aware of what went on in all these studies, and is quite familiar with all the consultants. He's going to set the program in perspective for you, and give you an introduction into the program itself.

Introduction - Phase I Feasibility Studies

Paul Duffett, EMR

Today we are going to deal entirely with the results of the feasibility studies that took place under Phase I of the RCDP.

As Elliot Rodger stated yesterday, the RCDP began in the fall of 1982. The program was designed to look into ways and means of reducing oil consumption in remote communities throughout the country. It became quite clear in the early part of the program, that it was necessary to carry out some overview studies in each region in order to establish an information base from which we could launch the various provincial feasibility studies.

The overview study carried out in Newfoundland took place during the winter of 1982 and was completed by the summer of 1983. It established the number of remote communities in Newfoundland. We identified many of them by their linkage to Hydro's diesel systems. There were a number of other communities that came to our attention as a result of the digging that the consultants did. We ended up with 79 remote communities as defined within the context of the program. The overview study went on to establish demographic characteristics, energy consumption profiles, and applicable energy conservation technologies.

With this study in place, we proceeded to launch a number of feasibilty studies in the area of wind energy, mini- or micro-hydro, biomass, and energy conservation. The result of this process was that 11 studies were initiated with funding by EMR and several other provincial agencies. It was necessary to involve these outside agencies because the RCDP was set up as a seed-type program and as such had relatively limited resources. These agencies were also involved in the management and organization of the studies.

Of the 11 studies funded, a total of $350,000 worth of consultants work was carried out, of which EMR's contribution amounted to about $245,000. The remainer--$105,000--came from the aforementioned agencies. We veiw their contribution as being significant given prevailing economic conditions.

The Mary's Harbour mini-hydro study was funded by Newfoundland and Labrador Hydro, the Department of Municipal Affairs and Housing, and EMR. The Rigolet study was funded by Municipal Affairs and EMR and was carried out with the co-operation of the town of Rigolet. The L'Anse-au-Clair study was largely funded and carried out by that town, with assistance from EMR. The South Coast wind study was carried out with the assistance of Hydro. The St. Anthony wind study involved that town, the Department of Mines and Energy and again, Hydro and EMR. The Labrador Coast wind study was about the only study funded solely by EMR and it was a continuation of the feasibility work we were doing with wind for the entire province. The Roddickton biomass study involved the Department of Forest Resources and Lands, the Department of Mines and Energy, and the White Bay Central Development Association. The Coastal Labrador and Northern Newfoundland biomass study involved the Department of Mines and Energy, EMR, and the Rural Development Council in Gander. The Cartwright/Black Tickle study involved the Eagle River Development Association and EMR. The Energy Conservation and Fuelwood Substitution study involved the Rural Development Council and EMR. Finally, the Pinsent's Arm/Norman Bay study was largely instituted as a result of the efforts of the East Shore Labrador Development Association and was funded by EMR.

All of these studies would not have been possible except for the determination and dedication of the individuals involved in the organizing groups. These studies all fall into a class of somewhere between the pre-feasibility and feasibility stages. Some are a bit more in-depth than others. Some only scratched the surface. But they all have raised the awareness of the various groups involved. They've allowed us to move a little closer to seriously addressing the energy problems of remote communities in Newfoundland. I think we've captured the attention of most of the players in the energy issues and alternatives field, throughout the province. In the near future, we hope there will be meaningful planning and discussion taking place at all levels, resulting in an integrated approach to solving the energy problems at hand.

I'd like to remind you that copies of all these reports are available from the EMR office in St. John's at no cost.

Introduction - Mini-Hydro Studies

Nat French, Conference Chairman

To begin with, we are going to be looking at a block of three mini-hydro studies.

Our first presenter is George Sturge of Newfoundland and Labrador Hydro. The type of work he's been involved in includes the design of generating and terminal stations for the 230 kv power system; feasibility studies for Hydro plants, including mini-hydro and other energy systems; and design of the Roddickton mini-hydro project and the Bay D'Espoir water system for the fish hatchery. He has worked with Newfoundland Light and Power, Bowater Power Corporation, Newfoundland Hydro, and served a term on the Deer Lake town council.

Mary's Harbour Study

Presenter: George Sturge
Manager of Engineering
Newfoundland and Labrador Hydro Corporation

Introduction

1. General

The Study reported herein was undertaken by Newfoundland and Labrador Hydro under the RCDP of EMR Canada.

The Department of Municipal Affairs of the Province of Newfoundland and Labrador is proceeding with a water supply and sewage system for the community of Mary's Harbour, Labrador. At their proposed dam site there is potential for a mini-hydro development.

The hydro site was previously identified in the Newfoundland and Labrador inventory "Study of Small-Scale Hydro" prepared by Shawmont Newfoundland Limited (Shawmont Report: # SM-2-79).

The approval of the water supply and sewage system for Mary's Harbour by the Department of Municipal Affairs presented a new opportunity to review the hydro project in relation to a joint development utilizing common facilities.

The purpose of this study was to determine the technical and economic feasibility of the mini-hydro development with the integration of the mini-hydro project with the community water supply and sewage system.

The study was jointly funded by EMR Canada, the provincial Department of Municipal Affairs, and Newfoundland and Labrador Hydro.

2. Proposal and Agreements

Newfoundland and Labrador Hydro submitted a proposal for a study of a mini-hydro development at Mary's Harbour, Labrador, under the RCDP in a letter to EMR Canada, dated 1983 04 12.

A study agreement was approved by EMR, Canada in their letter to Newfoundland and Labrador Hydro dated 1983 07 26. A separate agreement of funding was approved by the Department of Municipal Affairs in their letter of 1983 04 13 from the Minister to EMR.

3. Study Approach

The study was carried out in three (3) stages as follows.

- Stage I - Attain Information

  - Compile topographical information
  - Compile hydrological information
  - Visit site, survey site to obtain topographical information and to locate structure sites, check local availability of construction materials

- Stage II - Process Information

  - Complete hydrology study
  - Complete power and energy study taking into account project energy demand and winter flow conditions
  - Prepare conceptual sketches of structures
  - Prepare construction schedule
  - Prepare cost estimate

- Stage III - Compile Information Into Report Form

  - Prepare feasibility report including a description of the project
  - Prepare a cost effectiveness analysis for various levels of funding
  - Give a copy of the final report to the community--if the community so wishes, Hydro will make a presentation on the study to the community

The study schedule for the work was as follows.

- Stage I: August 15, 1983 to September 15, 1983
- Stage II: September 15, 1983 to October 30, 1983
- Stage III: October 30, 1983 to February 29, 1984

During work on the water supply and sewage system, the firm of Sheppard, Hedges and Green Ltd. carried out engineering survey work including centreline profiles for the dam site, pipeline/penstock route, and powerhouse site. This survey information was made available by Sheppard, Hedges and Green Ltd. and was used in Stage I of the study. A reconnaissance site visit was made by Hydro staff to confirm structure locations, obtain topogaphical information, and check on local availability of construction plant and materials.

4. Meeting With Sheppard, Hedges and Green Ltd.

During the study a meeting was held with Mr. Charlie Sheppard of Sheppard, Hedges and Green Ltd., to review the aspects of each project, identify common facilities and associated costs. Subsequently, Sheppard, Hedges and Green Ltd. reviewed the common facilities and optimized on their requirements and provided the final costs associated with the water supply and sewage system.

5. Cost Effectiveness Analysis

This study addresses the economics of the hydro development with and without savings from common facilities and/or additional funding becoming available to the mini-hydro project.

The main scenarios considered in the economic analysis are:

(a) Economics of hydro development alone,
(b) Economics of hydro development with total savings from common facilities,
(c) Economics of hydro development with 50% savings from common facilities,
(d) What additional funding, if any, is required to make the project have a cross-over date of 5, 10, and 15 years.

Summary and Conclusions

(a) Integration of a mini-hydro development with a community water supply and sewage system at Mary's Harbour, Labrador, is technically feasible.

(b) A mini-hydro development can be built in conjunction with a proposed water supply and sewage system and a water main can be simply tapped off the penstock near the proposed powerhouse site.

(c) The common facilities of the projects are:

(1) Road from community
(2) Dam
(3) Intake
(4) Fishway
(5) A section of water main between the powerhouse and dam

The total direct cost (1983 dollars) of these common facilities is estimated at $364,000.

The common facilities and subsequent cost savings associated with the dam, intake, and fishway are somewhat limited by different specific requirements of each project. The hydro dam and fishway are much more extensive than those required for the water supply and sewage project mainly because of the large diameter of penstock and submergence requirements.

The major cost savings are in the pipeline and access road. To best utilize the savings from the access road, construction must be rescheduled in Stage I of the water supply and sewage system project so that access is available prior to the start of the hydro project.

Both projects were reviewed during the course of the study to minimize dam and fishway requirements and to optimize each project, thus placing both projects in the proper perspective for comparison of common facilities.

(d) The total capital cost estimate for the mini-hydro development, if built independently of the water supply project is $3,024,000. The total capital cost for the same project realizing the common facilities is $2,454,000. The total savings over the two-year period of the project is estimated at $570,000. This figure may vary depending on the availability of funding during the construction period.

(e) A construction schedule was developed for the mini-hydro development based on a project release date of May 1, 1984. The actual construction would be carried out in the 1985 construction season to allow time for design and realizing the relatively long turbine/generator delivery period. The on-power date is November 30, 1985. It is felt that the construction work must be completed in one season; however, the schedule is extremely tight mainly due to fisheries restrictions which require that cofferdam and in-stream dam construction not proceed until after September.

(f) The hydro project does pose environmental concerns, but preliminary investigations indicate that the concerns can be resolved with mitigative action. The major item of environmental concern is that of fish passage. This can be mitigated by provision of a fishway and the release of a compensating flow during part of the year. Scheduling of construction around the critical fish passage period is also an effective means of mitigation.

(g) Without additional funding in the form of a joint development or direct subsidy, the Mary's Harbour mini-hydro development is marginally cost-effective, i.e., cross-over occurs after 27 years. Under these conditions it is unlikely that Hydro would proceed with the project. A projection of the level of additional funding required to improve the project's viability is between $767,000 and $2,079,000 based on the present estimate of capital costs. This, of course, includes common facilities from the water and sewage project and any funding available under the RCDP.

Introduction

Nat French, Conference Chairman

Our next presenter is Charlie Sheppard, partner and director of Sheppard, Hedges and Green, and, of course, manager of the Clarenville office. He's primarily involved in business development, and municipal and heavy civil engineering. Charlie is going to tell us about the Rigolet project.

Rigolet Study

Presenter: C.E. Sheppard,
Sheppard, Hedges and Green Limited

1. Background

The Rigolet mini-hydro/water supply study investigated the feasibility of combining a mini-hydro project with a water supply system, in order to take advantage of cost savings that might result by combining facilities wherein they could be utilized for both projects. It was hoped that by doing so, an otherwise unfeasible hydro project might be made feasible.

The community of Rigolet is located at the mouth of Lake Melville on the coast of Labrador and is now serviced with electricity by four diesel generators. This study is centred around Rigolet Brook, just north of the community.

Several alternative schemes were investigated. The following alternative is, in the firm's opinion, the most technically and economically feasible.

2. System Operation

Water is fed to the turbines through a penstock by a propeller pump located in the vertical intake pipe. The penstock is a siphon and the pump is used to add head at the intake, thereby reducing the siphon head and consequently the negative pressure at the high point in the siphon.

The turbines operate under a steady flow condition which is adjusted twice annually. The steady state flow prevents hydraulic transients and large negative pressures from occurring in the penstock. Negative pressures are restricted to a maximum of -7.6 metres to limit the possibility of cavitation in the piping and enable the siphon to operate independent of pumping for part of the year.

The penstock can operate as a true siphon (without pumping) during the months of May through December when the reservoir is at FSL and is capable of delivering a steady state flow of 0.40 m^3/S to the turbines under a head of 34.4 metres.

From January to April the flow is reduced to 0.31 m^3/S and the level in the reservoir will steadily decrease from a FSL of 44.5 metres to a LSL of 40.5 metres. A 20 kw pump will be required during this period to maintain a constant head and flow at the turbines. The presence of the pump would ensure that the system would always function even if the true siphon could not be maintained.

A smaller pump which would be capable of overcoming the maximum head of the siphon would also be required to charge the penstock and maintain flow to the community in the event of failure of the propeller pump.

A vacuum pump and access point would be required at the high point of the siphon in order to periodically purge the line of entrapped air.

This type of operation eliminated several significant technical problems and at the same time enabled us to cut costs which were common to all the other alternatives considered.

With steady state flow conditions it was no longer necessary to have a surge tank since the water flow was not mechanically controlled in relation to electrical demand. Difficulties encountered with hydraulic transients were therefore overcome. Although there were still negative pressures to contend with because of the siphon, they were constant rather than changing with load conditions.

The problem of water start-time in relation to mechanical start-time caused by the long penstock, was eliminated since flows do not change with load change.

The use of an electronic load governor and steady state flow conditions, enabled us to strip down the hydro mechanical equipment and to use cheap impeller turbines rather than more expensive models.

3. Civil Works

The proposed scheme consisted of the following work:

i. Dam
ii. Access roads
iii. Intake structure
iv. Penstock
v. Powerhouse equipment
vi. Power transmission line
vii. Connection to the water supply

(i.) Dam

The drainage area of Rigolet Brook is very small--only 22.59 km^2. Minimum runoff occurs during the winter months as is common with northern rivers. The dam was designed to create storage so that power could be generated in the winter months when it was required.

The proposed dam is to be constructed of rock fill with a protected synthetic membrane liner, (**Figure 1**). Rock fill was chosen primarily because it could be placed in almost all weather conditions and because we were uncertain about the availability and suitability of till in the area. Also, the cost of a rock fill dam would almost certainly be greater and therefore provided an element of safety in estimating, especially if suitable till could be found before the design was finalized.

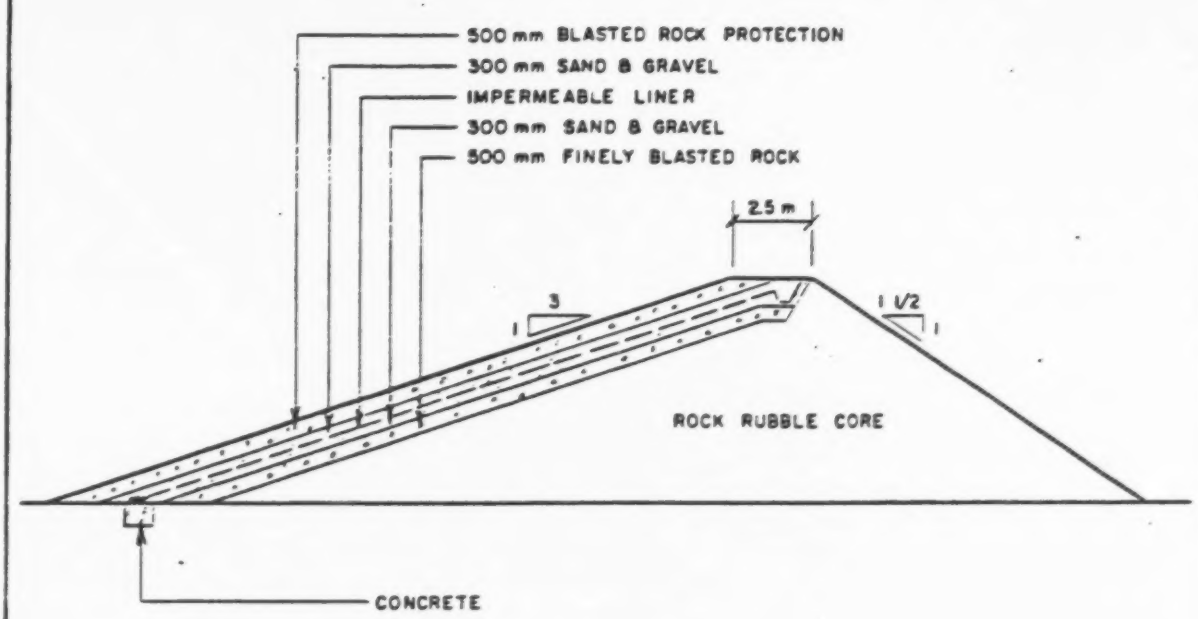
(ii.) Access Roads

Fortunately, a gravel pit which had material suitable for road building was found near the community. Since the in situ material along the proposed access road was unsuitable as a foundation--it had a high silt content and was saturated--it was decided to build the road entirely out of fill without disturbing any of the underlying material, even the grubbing.

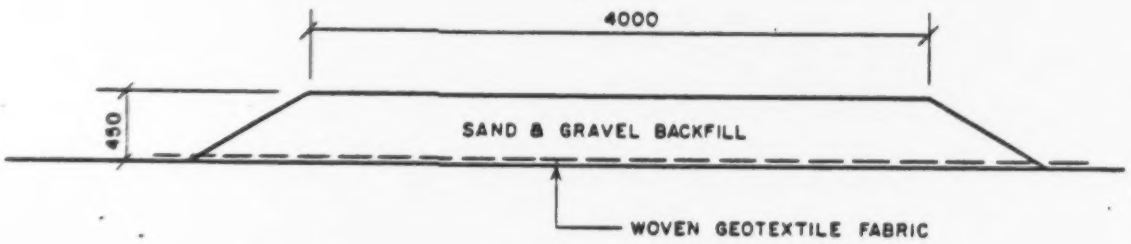
A woven geotextile is to be placed over the existing ground after the trees and shrubs have been removed, the stumps lowered flush to the ground and a 450 mm layer of fill placed on top of this, (**Figure 2**).

(iii.) Intake Structure

The intake consists of a reinforced concrete intake structure with fish screens, propeller pumps feeding the penstock and a smaller submersible pump to charge the penstock and act as a backup for water supply for the town. The structure would also have the usual stop logs and trash racks, (**Figure 3**).



PROJECT TITLE: RIGOLET MINI-HYDRO STUDY	SHEPPARD, HEDGES & GREEN LIMITED	
	SCALE	NTS
DRAWING TITLE: DAM SECTION	DRAWN BY	C. P. WAY
	DATE	84-11
	FIGURE NO	1



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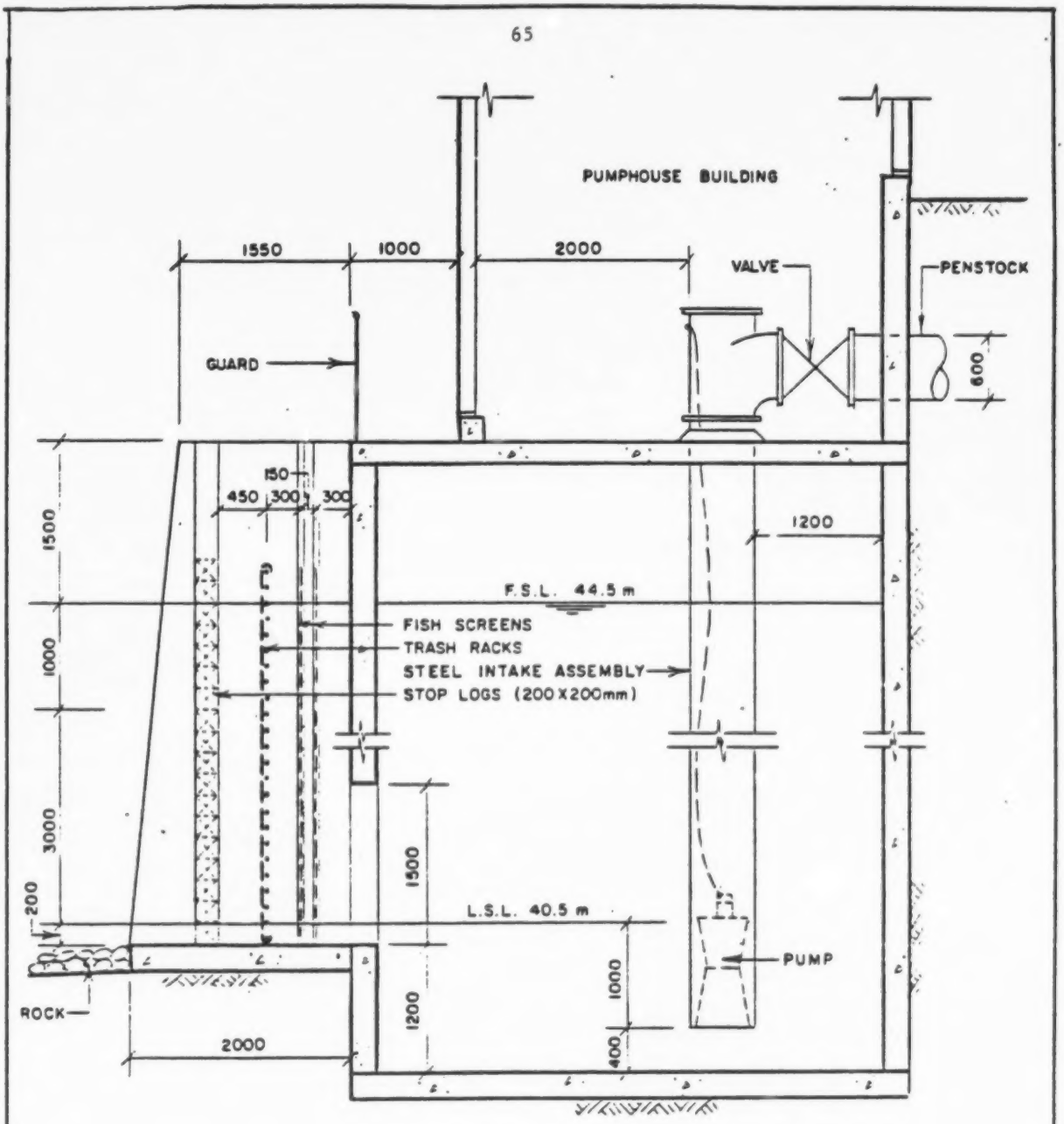
DRAWING TITLE: ACCESS ROAD CROSS SECTION	DRAWN BY: C. P. WAY
	DATE: 84 – 11
	FIGURE NO.: 2



PROJECT TITLE: RIGOLET MINI-HYDRO STUDY	SHEPPARD, HEDGES & GREEN LIMITED
	SCALE: NTS
	DRAWN BY: C. P. WAY
DRAWING TITLE: INTAKE STRUCTURE SECTION	DATE: 84-11
	FIGURE NO: 3

(iv.) Penstock

The penstock is 2480 metres long and 610 mm in diameter. Under normal circumstances, this information alone would probably be sufficient to convince everyone to abandon the project. This case is an exception.

The material chosen for the penstock was fibre-reinforced plastic. Of the various materials considered, FRP pipe best solved the problems of negative pressures, secure joints, weight, ease of installation, and cost.

The penstock is to be installed in a partially shallow buried and partially deep buried trench, (**Figure 4**). This is required for several reasons:

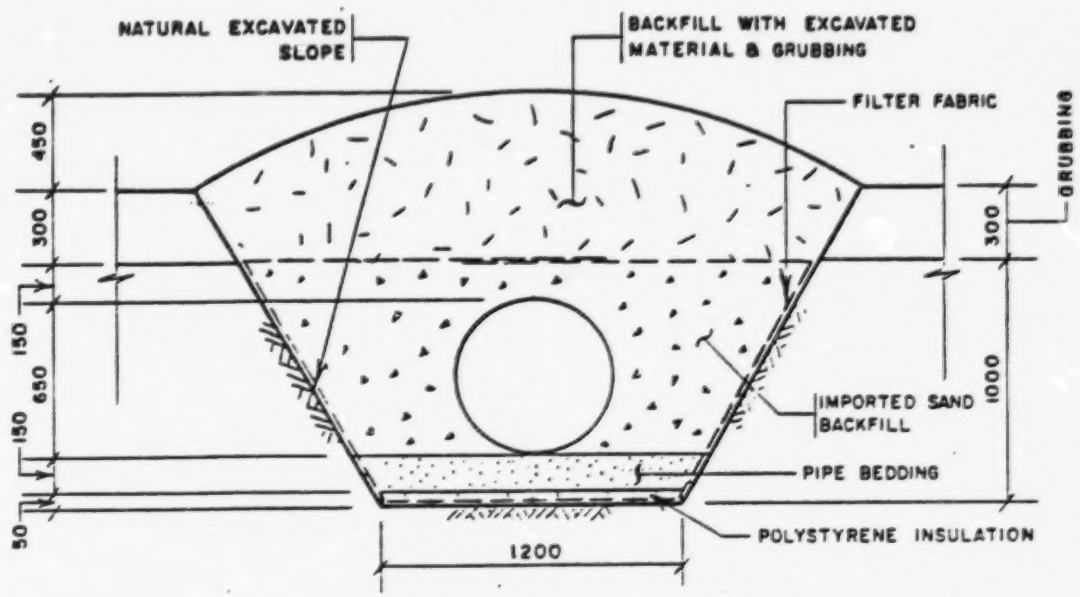
1. The deep buried trench is required because the penstock is a siphon and extra depth is needed at the high point to reduce the siphon head and enable the system to operate as a true siphon without pumping when the reservoir is at FSL.

2. The shallow buried trench is used wherever possible to avoid excavation because the soil conditions are extremely poor, i.e., anywhere from 17% to 38% passing the No. 200 sieve, and the groundwater table is at the ground surface.

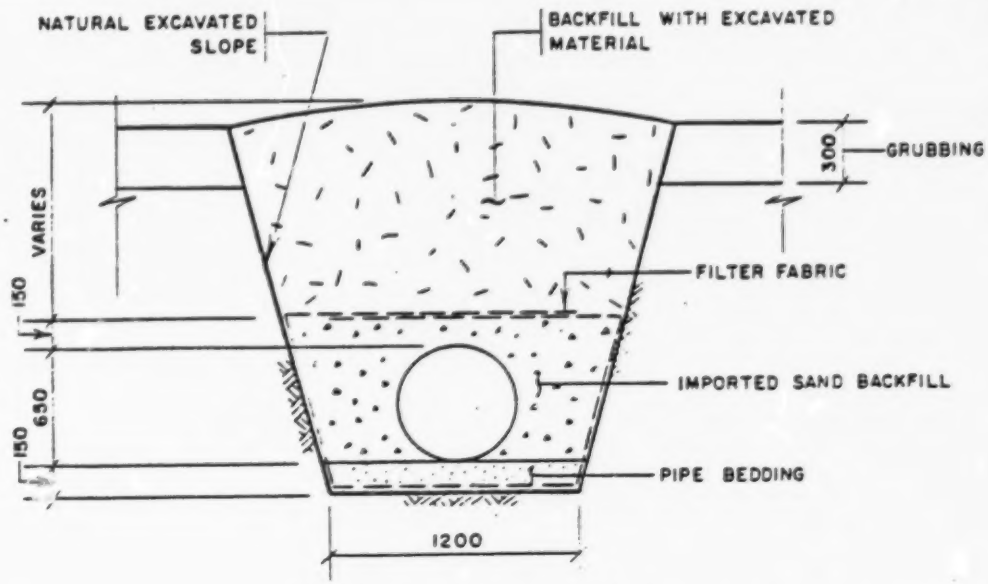
   The shallow buried pipe however creates another problem: that of freezing. While there is no problem with freezing of the water in the pipe, freezing of the ground underneath the pipe, especially with the extremely susceptible soil, would no doubt cause considerable frost heave thereby causing damage to or leakage in the pipe. This is to be overcome by insulating underneath the pipe with a 50 mm layer of polystyrene insulation.

(v.) Powerhouse Equipment

The powerhouse itself is a simple wood frame structure on a concrete foundation, (**Figure 5**). The mechanical equipment consists of one (1) 20 kw propeller pump pumping to two (2) impeller type turbines, and one (1) 2 kw pump to charge the penstock and maintain flow to the community when the large pump is out of service. The turbines are sized in accordance with the two (2) steady state flow conditions they are required to handle. The



SHALLOW BURY TRENCH



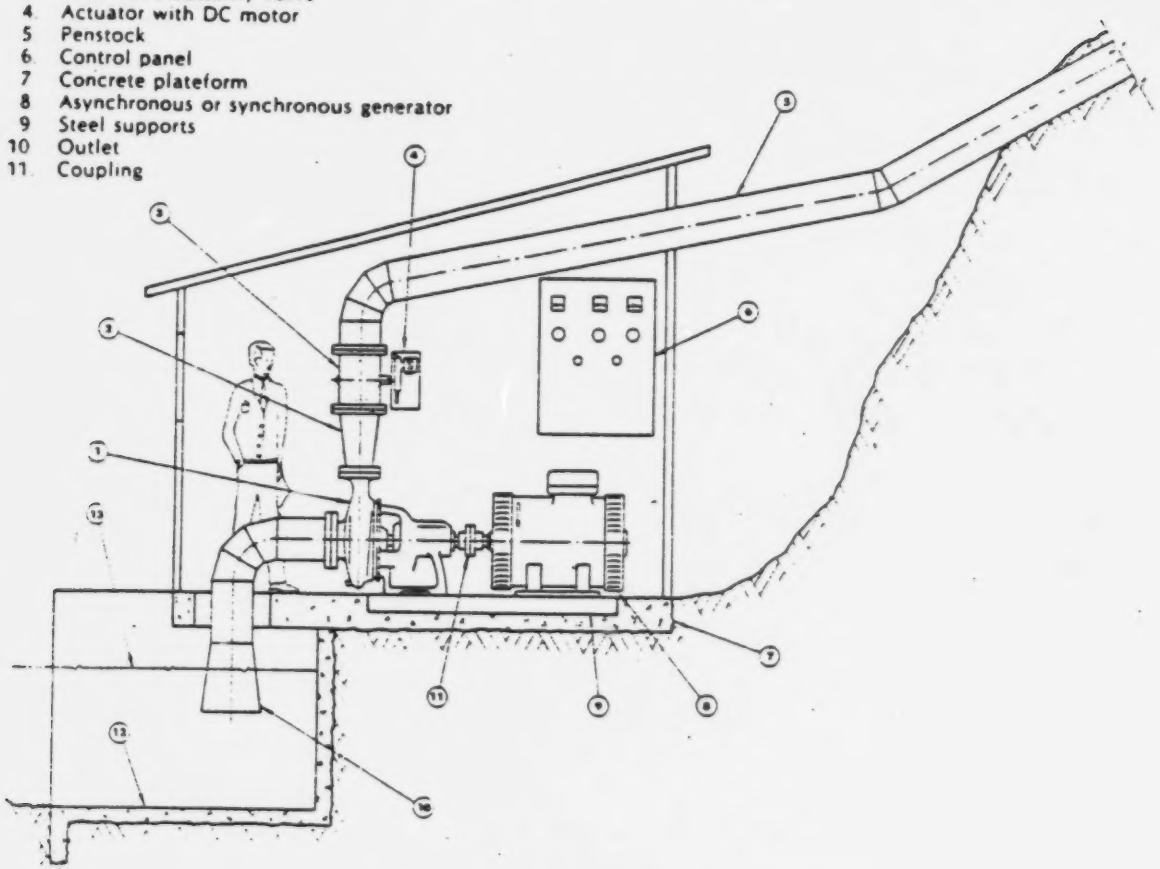
DEEP BURY TRENCH

PROJECT TITLE: RIGOLET MINI-HYDRO STUDY	SHEPPARD, HEDGES & GREEN LIMITED
	SCALE: NTS
	DRAWN BY: C. P. WAY
DRAWING TITLE: PIPE TRENCH DETAILS	DATE: 84-11
	FIGURE NO.: 4

HYDROLEC

S SERIES

1. S turbine
2. Intake cone
3. Automatic butterfly valve
4. Actuator with DC motor
5. Penstock
6. Control panel
7. Concrete plateform
8. Asynchronous or synchronous generator
9. Steel supports
10. Outlet
11. Coupling
12. Tailrace
13. Downstream level



HYDROLEC S SERIES TURBINE

From. 50 to 500 feet
- 0.5 to 15 cfs
- 5 to 250 kW each.

Fig. 5

larger turbine is designed to handle a flow of 0.31 m^3 per second under a head of 35.5 metres which corresponds to the steady state flow for the months of January through April. The smaller turbine is designed to handle a flow of 0.09 m^3 per second under a head of 34.4 metres. Both turbines would operate during the period from May to January at a combined flow rate of 0.40 m^3 per second and at a head of 34.4 metres.

The pump will not operate during the summer months but will be required to add average monthly heads varying from 0.4 metres to 3.1 metres during the winter months in order to maintain the required head flow to the turbines.

The electrical equipment consists of a 120 kw alternator, control panel and electronic load governor. The system is designed to produce 600 volt, three phase, 60 Hz. power. The electronic load governor will regulate the system by maintaining a constant load on the system without altering the flow to the turbines. It accomplishes this by dumping the load into a resistor bank when it is not required and withdrawing it when demand increases.

(vi.) Power Transmission Lines

The power transmission line is required, not to transmit the power produced to the community, but to provide power for the pump at the intake. The power line would be approximately 2.5 km long and would be constructed in the conventional manner.

(vii.) Water Supply

The water supply would be tapped into the penstock above the powerhouse since the head would be needed to provide the required pressures and flows. No other work would be required other than that related entirely to the water supply.

4. Capacity and Energy

The capacity and energy was determined for us by Newfoundland and Labrador Hydro using standard methods for these calculations. This is a typical printout for a particular year, (**Figure 6**). The net energy from the system is the total produced less that used by the pump.

5. Construction Cost and Schedule

The entire project could be designed and constructed in eight (8) months, but because of the anticipated approval dates, equipment deliveries, and winter weather conditions, it is more likely to take 16 months as outlined in the schedule, (**Figure 7**).

RIGOLET MINI-HYDRO - P & E STUDY (For 125 KW Unit)
(Based on 1982 Forecast Data)

Year 1989	31	28	31	30	31	30	31	31	30	31	30	31	
PARTICULARS	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Accumul.
1. Basin Flow m3/s	0.12	0.10	0.08	0.14	1.39	2.07	0.70	0.55	0.48	0.58	0.37	0.19	
2. Modified B.Flow m3/s	0.31	0.31	0.31	0.31	0	0	0	0	0	0	0.40	0.31	
3. Plant Flow m3/s	0.31	0.31	0.31	0.31	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.31	
4. Plant Spill m3/s	0	0	0	0	0.99	1.67	0.30	0.15	0.08	0.18	0	0	
5. Peak Load Coeff.	0.98	0.85	0.70	0.65	0.69	0.62	0.52	0.68	0.81	0.76	0.95	1.00	
6. Peak Load KW	256.76	222.70	183.40	170.30	180.78	162.44	136.24	178.16	212.22	199.12	248.90	262.00	
7. Load Factor													
8. Production Coeff.	0.121	0.086	0.084	0.069	0.074	0.065	0.053	0.065	0.086	0.088	0.098	0.111	
9. Production Forecast MWH	880	880	880	880	880	880	880	880	880	880	880	880	
10. Net Produc. MWH	106.48	75.68	73.92	60.72	65.12	57.20	46.64	57.20	75.68	77.44	86.24	97.68	
11. Avg. Load KW	143.12	112.62	99.35	84.33	87.53	79.44	62.69	76.88	105.11	104.09	119.78	131.29	
12. Flow Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
13. R.P.P.	0.58	0.74	0.84	0.99	1.19	1.31	1.66	1.35	0.99	1.00	0.87	0.63	
14. Load Use Factor	0.99	0.94	0.91	0.87	0.93	0.98	1.00	0.99	0.87	0.87	0.91	0.97	
15. Power Main Demand KW	141.44	106.18	90.84	73.47	81.65	77.47	62.69	76.15	91.45	90.27	108.41	127.76	1,122
16. Hydro Power Sen. KW	83.10	83.10	83.10	83.10	104.00	104.00	104.00	104.00	104.00	104.00	104.00	83.10	1,144
17. Power Aux. Demand KW	3.00	7.60	12.00	16.00	0	0	0	0	0	0	0	0	39
18. Total Power Demand	144.44	113.78	102.84	89.47	81.65	77.47	62.69	76.15	91.45	90.27	108.41	127.76	1,166
19. Hydro Energy Prod. MWH	61.83	55.34	61.83	59.83	77.38	74.88	77.38	77.38	74.88	77.38	74.88	61.83	825
20. Total Energy Reqd MWH	107.46	76.46	76.51	64.42	60.75	55.78	46.64	56.65	65.85	67.16	78.35	95.05	851
21. Diesel Energy Reqd MWH	45.63	20.61	14.69	4.59	0	0	0	0	0	0	3.17	33.23	122

Fig. 6

RIGOLET MINI-HYDRO – CONSTRUCTION SCHEDULE

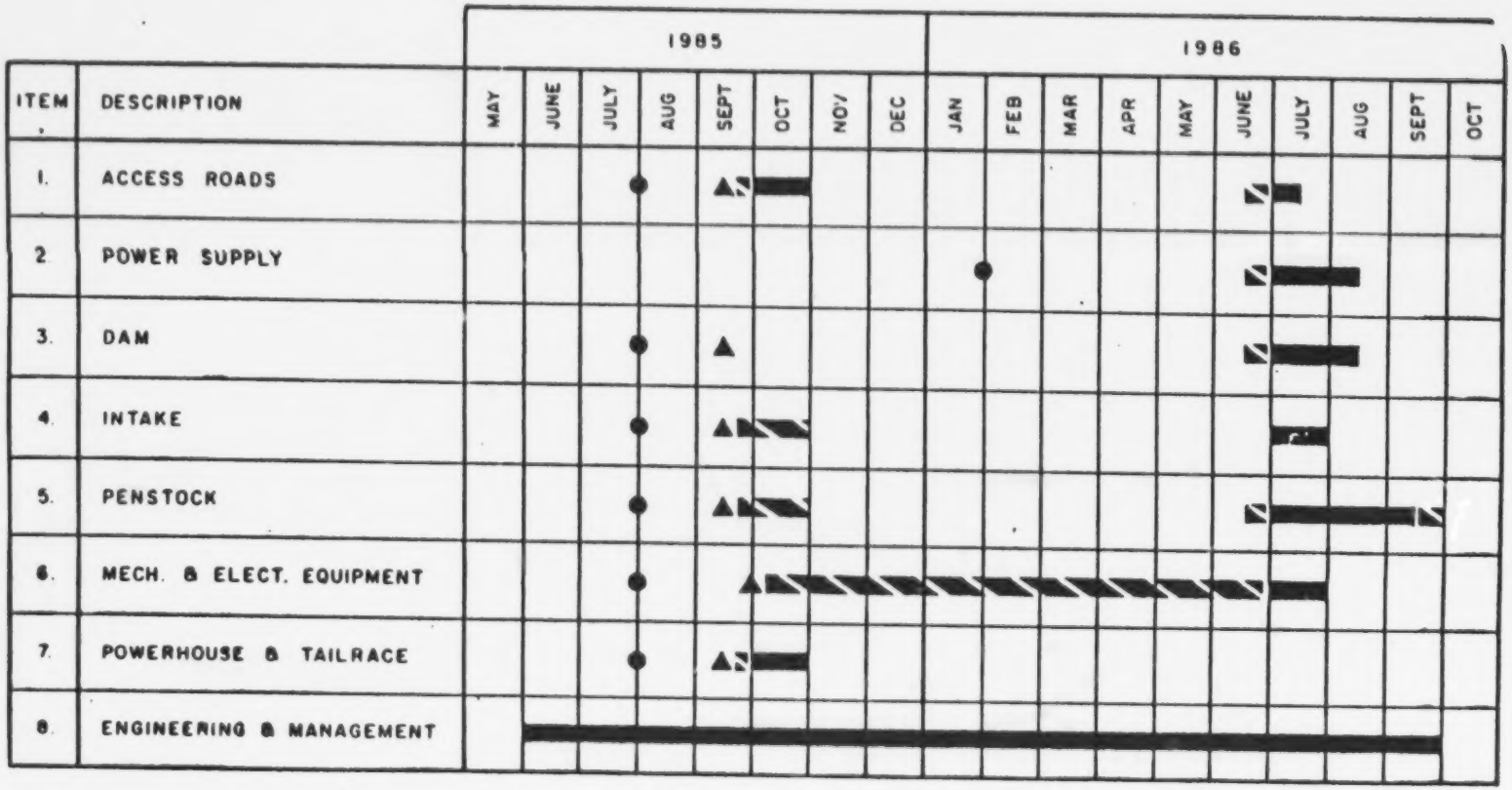


Figure 7

The cost of the joint mini-hydro/water project is estimated at $2,630,000 (in 1986 dollars) while an independent water supply would cost $1,350,000.

6. Economic Evaluation

A cost effectiveness analysis was carried out using the results of the capacity and energy study and O & M costs provided by Newfoundland and Labrador Hydro. The analysis demonstrated that the mini-hydro project alone was unfeasible within the forecast period, but a joint water supply/mini-hydro project achieved a crossover after 17 years, (**Figure 8**).

7. Conclusions

The report also shows that the project is technically feasible and provides the opportunity to demonstrate several unique features which would provide valuable information for future developments of this type.

a) The system is unique in that it combines pumping, siphon action and gravity flow to the turbine.

b) There will be no surge tank on the 2.5 km penstock.

c) The installation combines a domestic water supply for a community, with a hydro project.

d) It demonstrates the use of hydro power to displace diesel fuel in a remote community.

e) The system will incorporate unique design features in order to operate independent of weather conditions in a northern and remote location.

I would like to acknowledge the participation of Newfoundland and Labrador Hydro, especially the engineering and economic analysis branches, and thank them for their assistance. I'd also like to thank Acres Consulting Services Limited who spent considerable time in analyzing many of the unique technical problems we encountered in trying to arrive at a workable scheme.

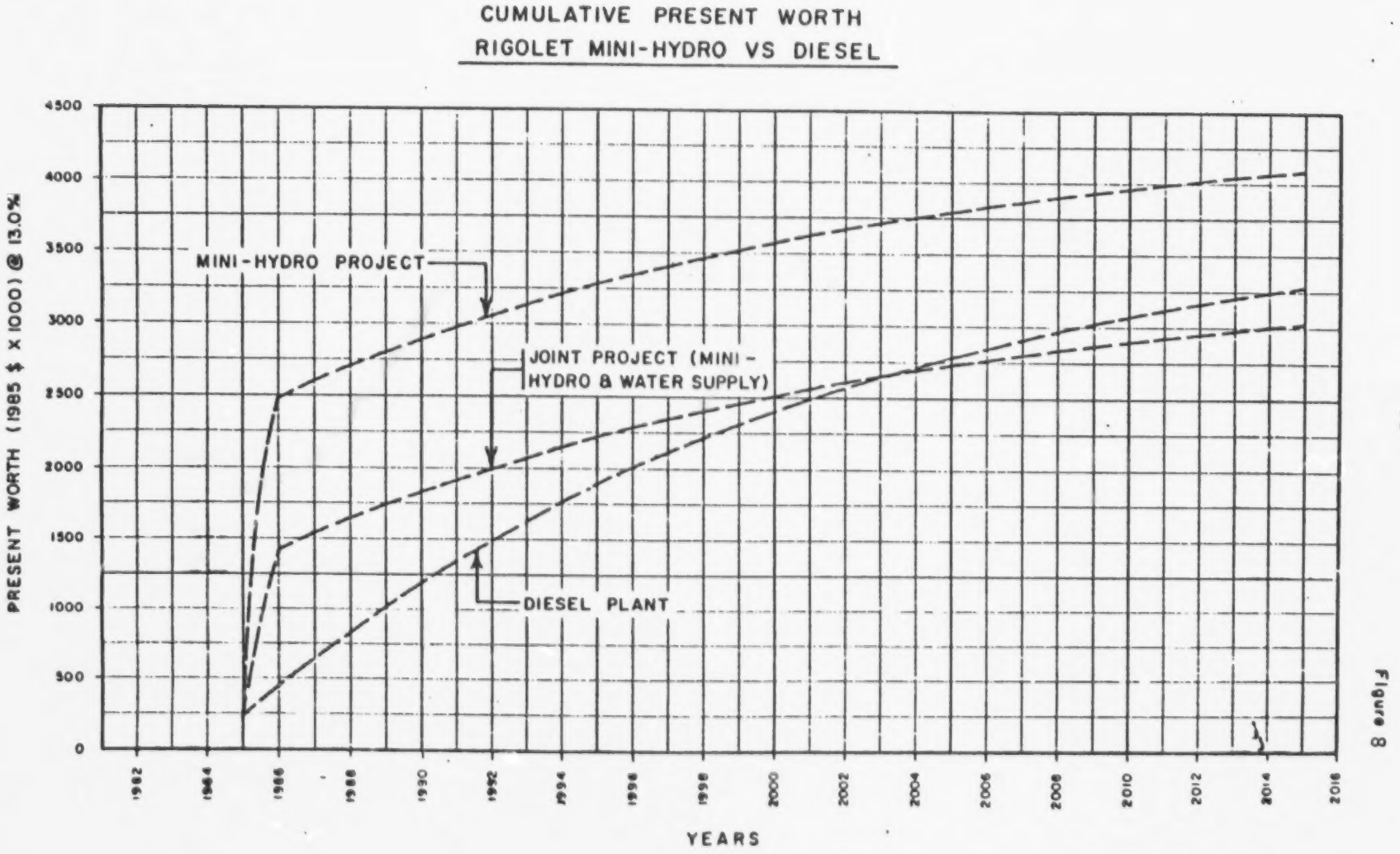

CUMULATIVE PRESENT WORTH
RIGOLET MINI-HYDRO VS DIESEL
PRESENT WORTH (1985 $ X 1000) @ 13.0%
4500
4000
3500
3000
2500
2000
1500
1000
500
0
MINI-HYDRO PROJECT
JOINT PROJECT (MINI-HYDRO & WATER SUPPLY)
DIESEL PLANT
1982
1984
1986
1988
1990
1992
1994
1996
1998
2000
2002
2004
2006
2008
2010
2012
2014
2016
YEARS

Figure 8

Introduction

Nat French, Conference Chairman

Come question and answer period, we're going to have to go back and ask these presenters what they are talking about. Engineers I've found, love to talk to other engineers. But some of us don't understand what they're talking about.

Our next speaker will be talking about the L'Anse-au-Clair project that was undertaken by Fenco Newfoundland Ltd. Our speaker is Dale Courage. He's involved in energy, and industrial- and offshore-related engineering.

L'Anse-au-Clair Study

Presenter: Dale Courage,
Fenco Newfoundland Ltd.

1. Community Background

L'Anse-au-Clair, a small community on the extreme south coast of Labrador, is one of 11 communities supplied with electrical energy from a 2000 kw firm capacity diesel generator station located at L'Anse au Loup. It is the third largest user of electricity of the eleven communities, making up approximately 13% of the annual energy demand in 1982.

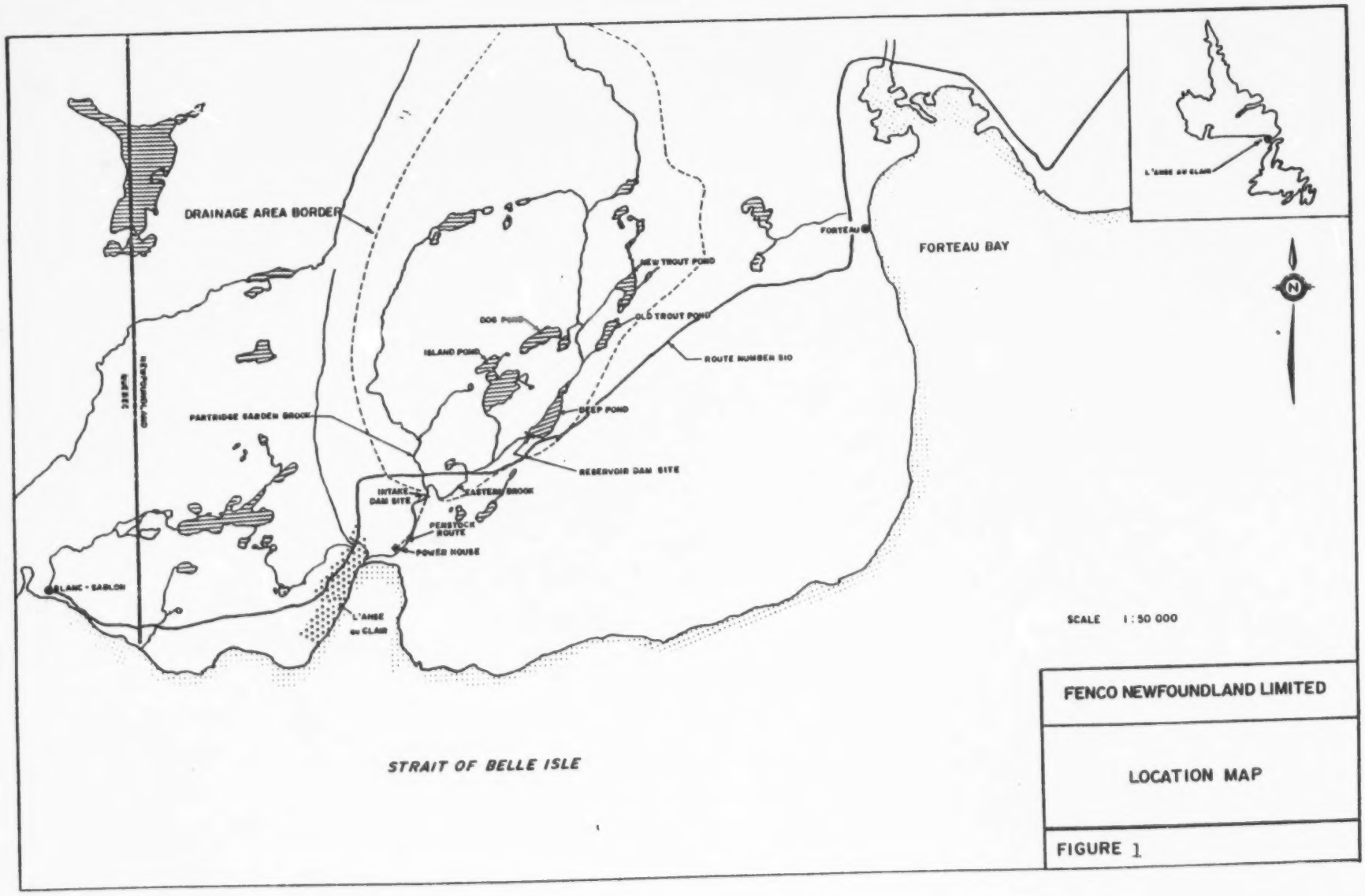
2. Catchment Area and Hydrology

The proposed mini-hydro development is located approximately half a kilometre east of L'Anse-au-Clair, on Eastern Brook, with a catchment area of approximately 25 km^2, (**Figure 1**). The catchment area includes the drainage areas for both Eastern Brook and Partridge Garden Brook which come together before emptying into the Strait of Belle Isle just east of the town.

Estimated Flows

January	.21	February	.19
March	.18	April	.22
May	2.04	June	1.61
July	.60	August	.55
September	.59	October	.66
November	.51	December	.34

Mean - .64 (m^3/s)


DRAINAGE AREA BORDER
NEWFOUNDLAND
QUEBEC
PARTRIDGE GARDEN BROOK
ISLAND POND
DOG POND
NEW TROUT POND
OLD TROUT POND
ROUTE NUMBER 510
DEEP POND
RESERVOIR DAM SITE
INTAKE DAM SITE
EASTERN BROOK
PENSTOCK ROUTE
POWER HOUSE
BLANC - SABLON
L'ANSE au CLAIR
FORTEAU
FORTEAU BAY
L'ANSE AU CLAIR
SCALE 1:50 000
STRAIT OF BELLE ISLE
FENCO NEWFOUNDLAND LIMITED
LOCATION MAP
FIGURE 1

The nearest river with streamflow records is the Saint Paul River in Quebec which is approximately 45 km west of Eastern Brook. These streamflow data were used to estimate the seasonal variation of Eastern Brook's streamflow as a function of its mean annual flow which was estimated as 70% of the mean annual total precipitation. The resulting flow data compared well with recorded streamflows for two other large rivers further north with the main difference being an earlier thaw-generated flow and a more even distribution of seasonal flows for Eastern Brook. Daily flow duration curves and flood frequency curves were then produced, (**Figures 2, 3 and 4**). The available flow for energy generation was later taken as 75% of actual streamflow due to preliminary Fisheries requirements (**Figure 5**).

3. Project Background

The basic scheme consists of:

a) a 65m long intake dam of compacted till with an excavated 30m wide spillway channel
b) a 1000m long penstock (800m diameter)
c) a 314 kw powerhouse
d) access roads to the powerhouse and intake dam
e) a 12.5 kV transmission line connecting the generator to the existing distribution system
f) a possible upstream storage reservoir
(**Figures 6, 7, 8, 9, 10 and 11**)

The turbine selected was an Ossberger (cross-flow) type which provides a relatively flat efficiency curve from 20% to 100% power output and can operate adequately at an output of 10%. The selected turbine generator set would have an electrical full output of 314 kw. The turbine would be rated at a peak output of 443 HP (330.5 kw), with a net head of 66.4m and a plant discharge of $0.62m^3/s$ at full output.

Alternative Scheme

An alternative smaller scheme, with an installed capacity of 192 kw, was also examined. The major civil works components would be unchanged except for the use of a smaller diameter (630mm) penstock. The turbine selected for this smaller scheme is of the same type as the larger one. The turbine would be rated at a peak output of 271 HP (202 kw), with a net head of 65.22m and a plant discharge of $0.384m^3/s$.

Figure 2

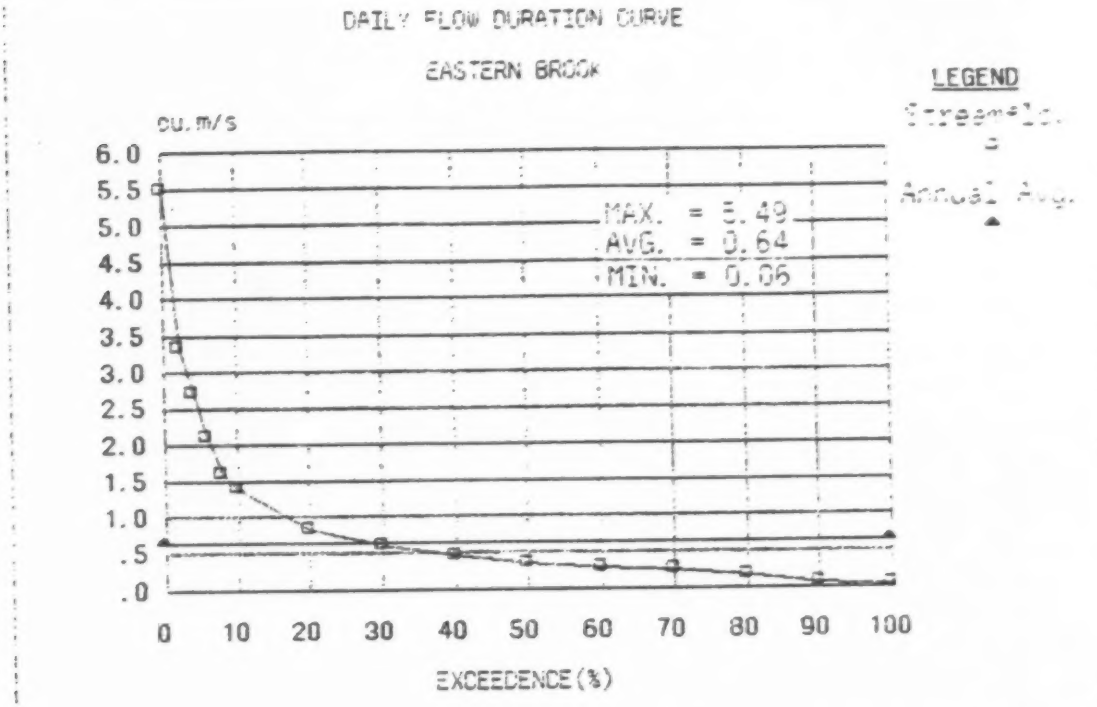


Figure 3

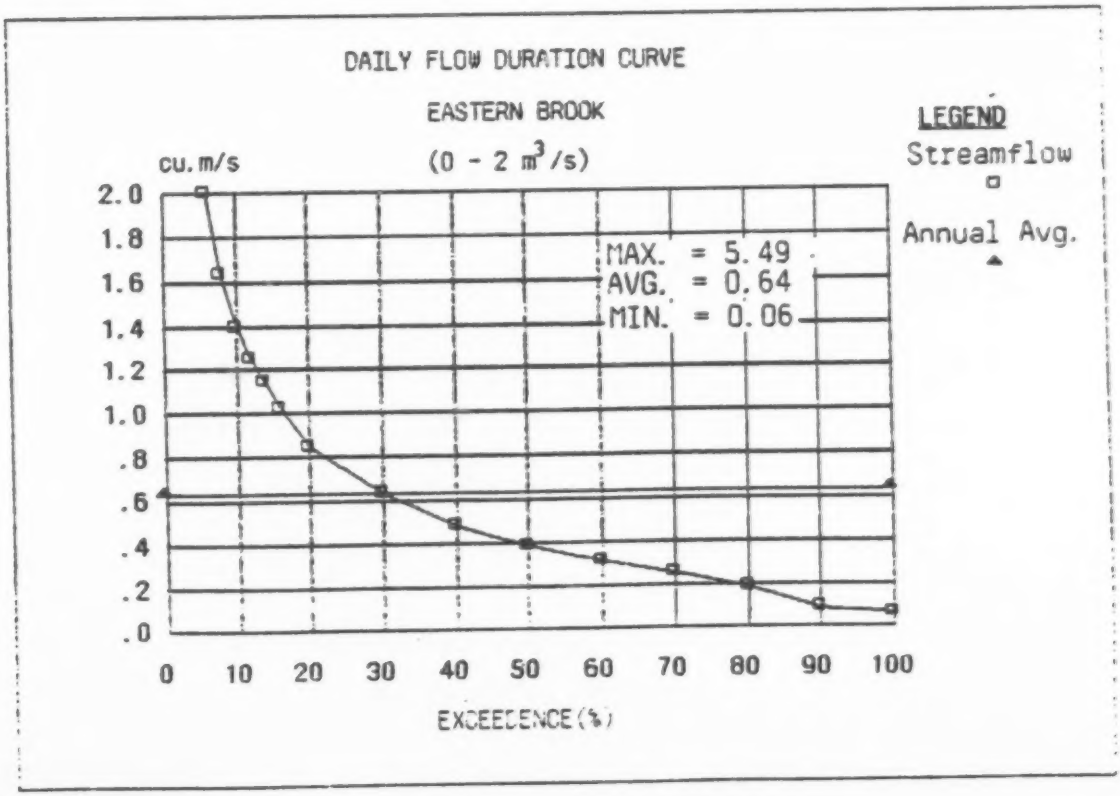
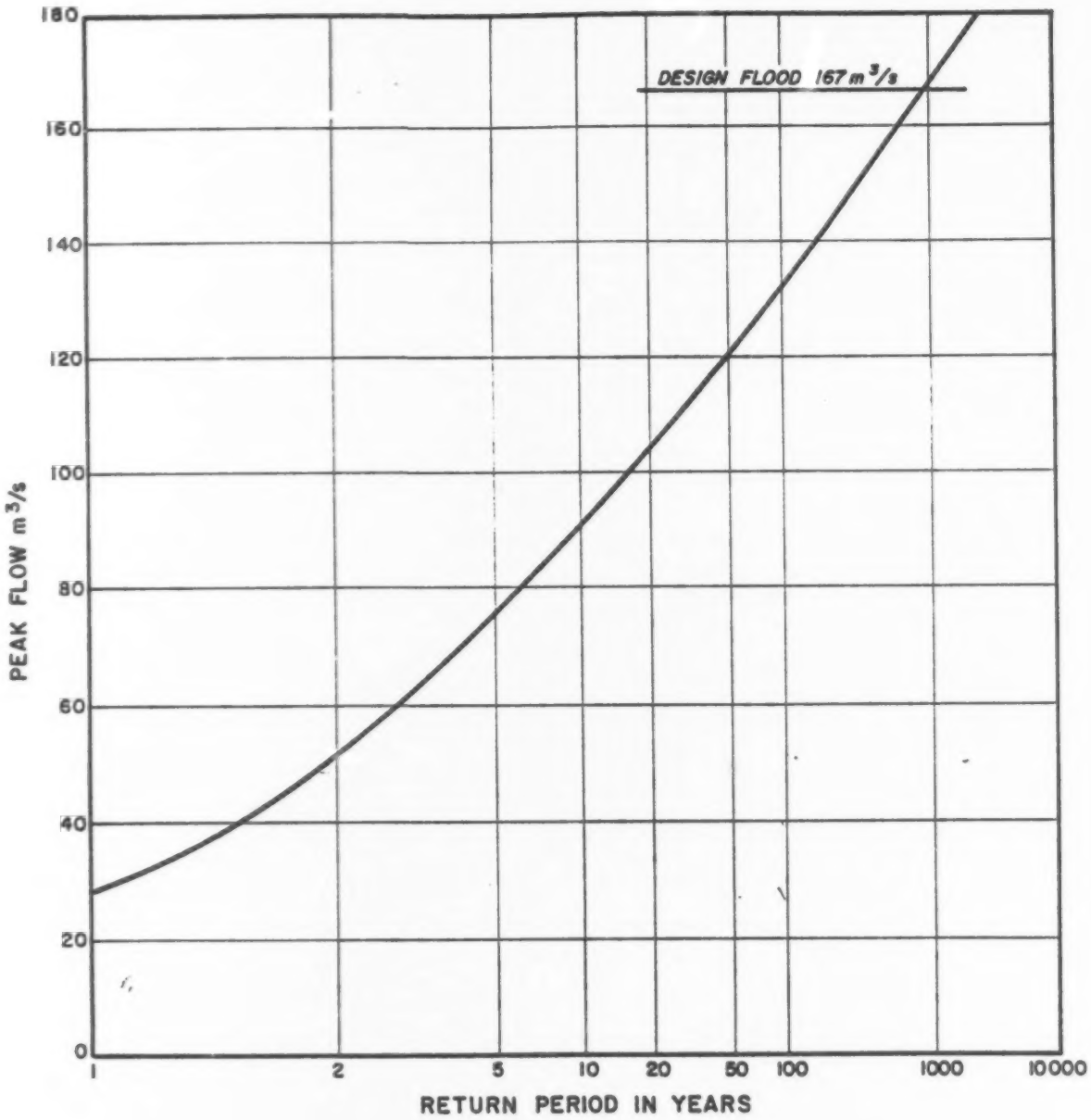
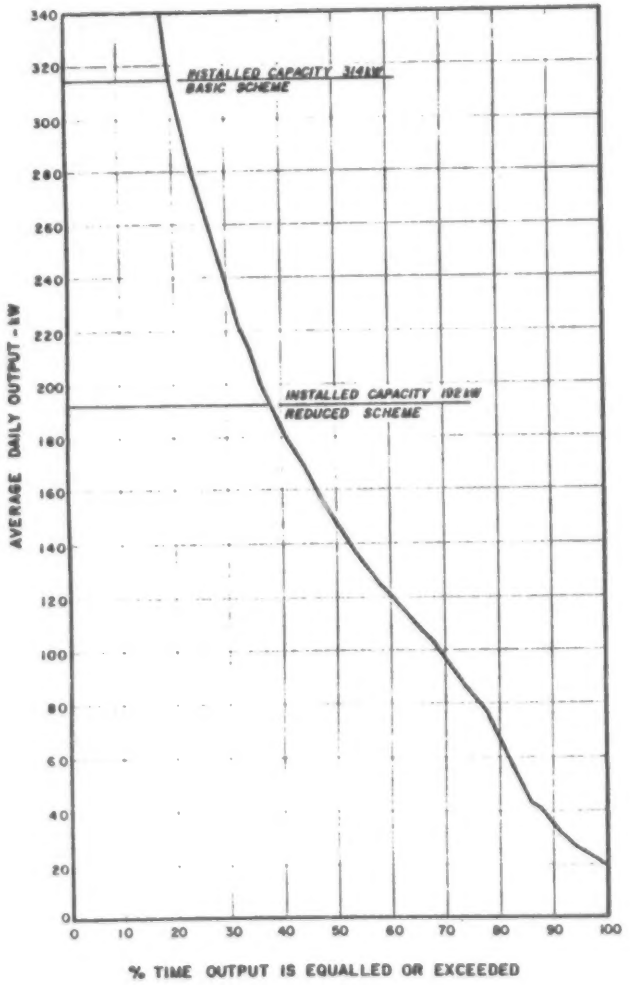


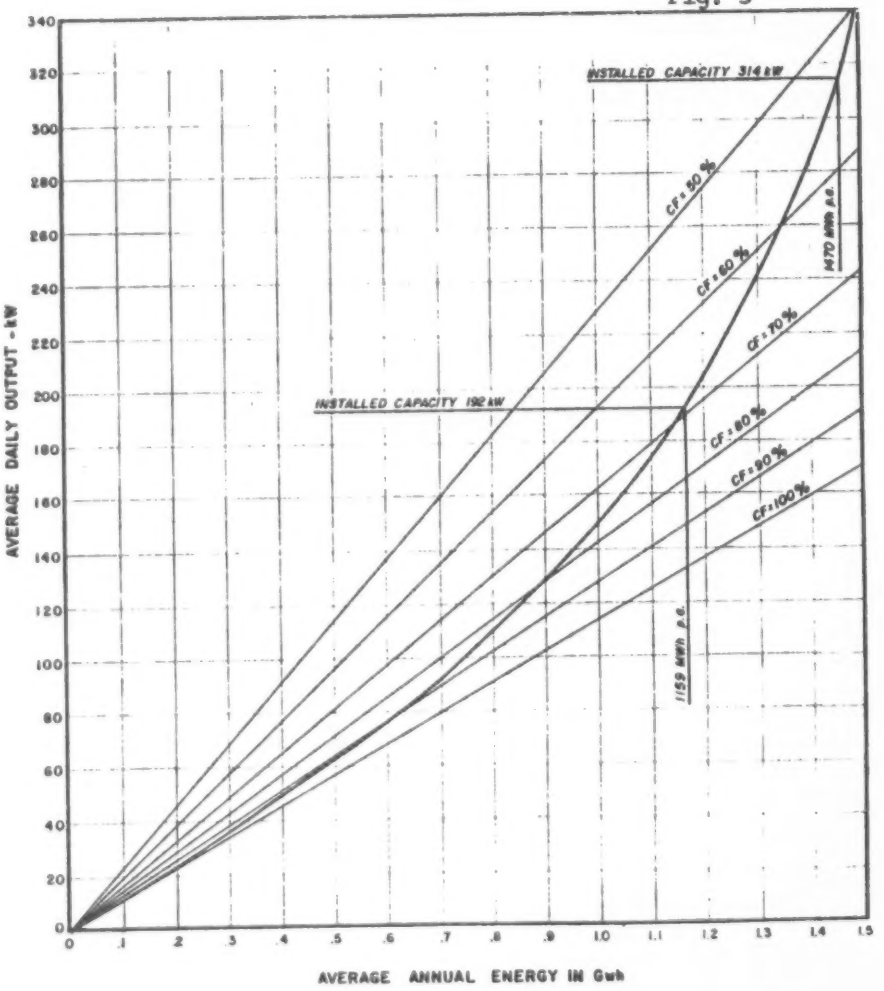
FIGURE 4



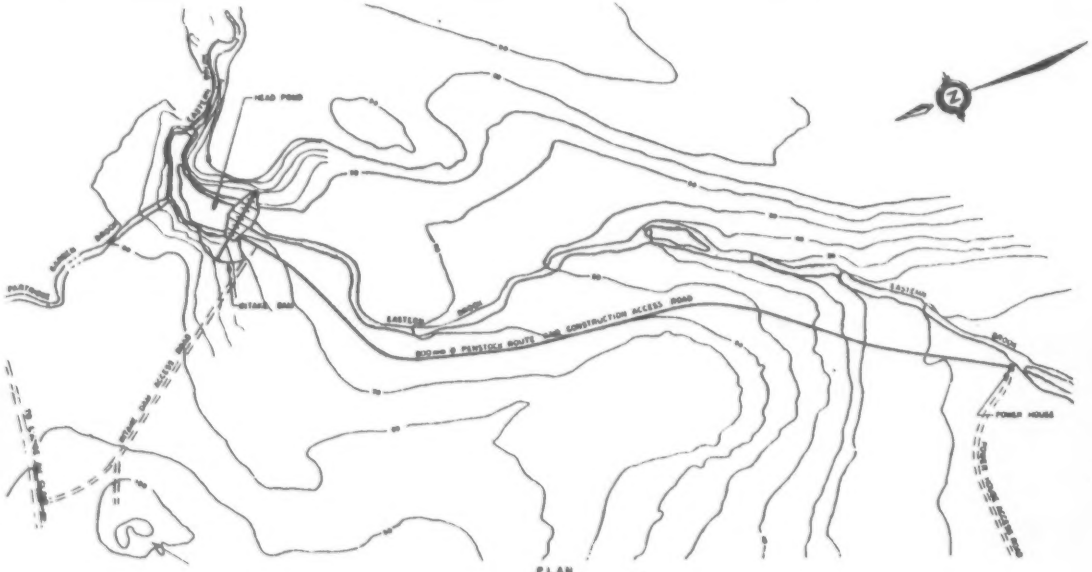
EASTERN BROOK
FLOOD FREQUENCY CURVE

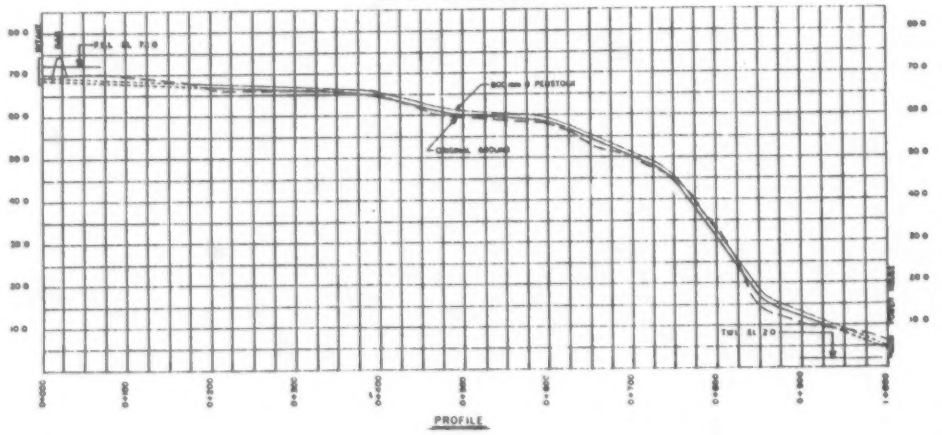
Fig. 5


INSTALLED CAPACITY 314 kW
BASIC SCHEME
INSTALLED CAPACITY 192 kW
REDUCED SCHEME
AVERAGE DAILY OUTPUT - kW
% TIME OUTPUT IS EQUALLED OR EXCEEDED


INSTALLED CAPACITY 314 kW
INSTALLED CAPACITY 192 kW
CF = 50 %
CF = 60 %
CF = 70 %
CF = 80 %
CF = 90 %
CF = 100 %
1170 MWh p.a.
1159 MWh p.a.
AVERAGE DAILY OUTPUT - kW
AVERAGE ANNUAL ENERGY IN Gwh

Note: Available Streamflow Taken As 75% of Actual Streamflow Due to Preliminary Fisheries' Requirement.

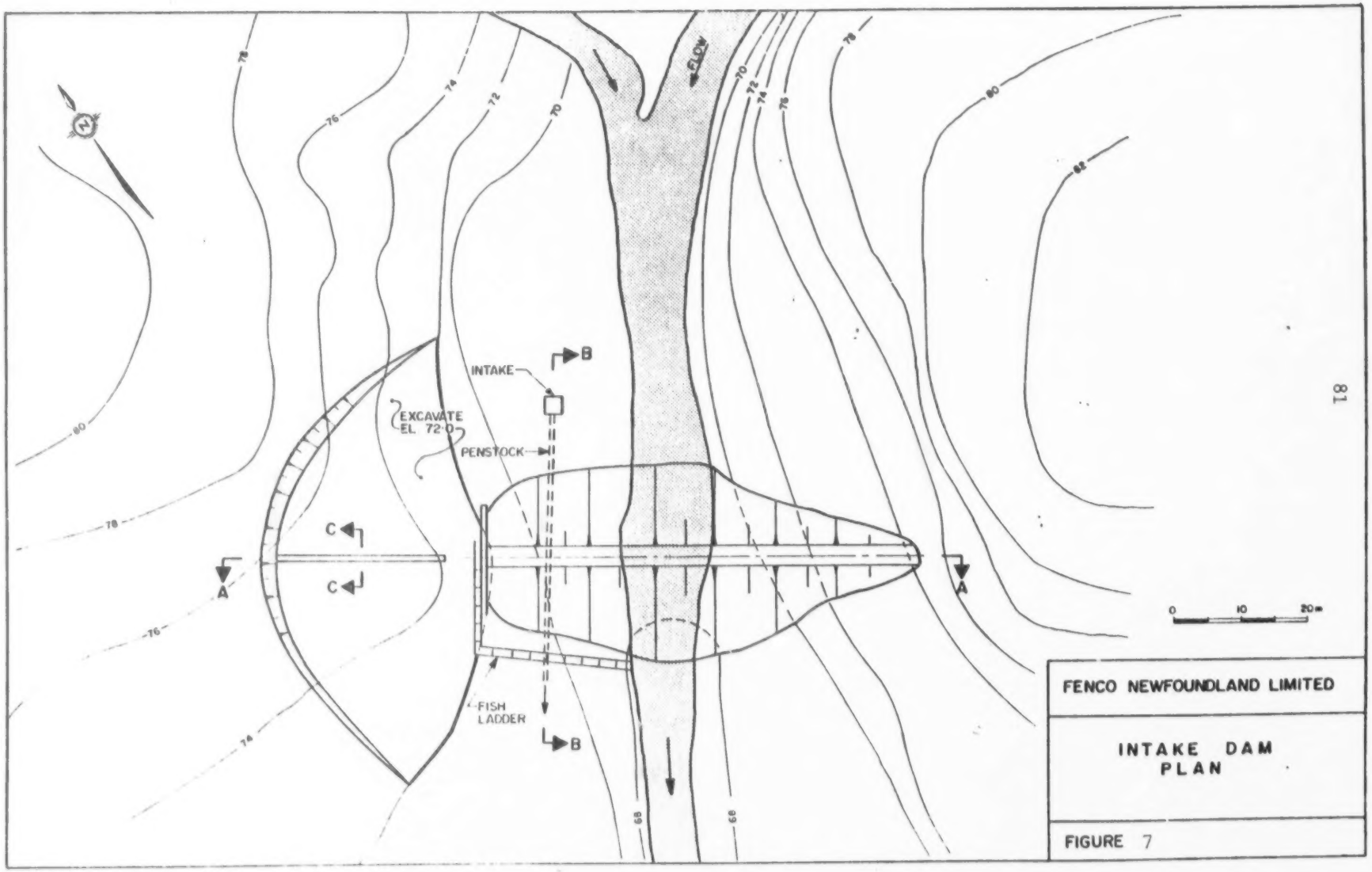


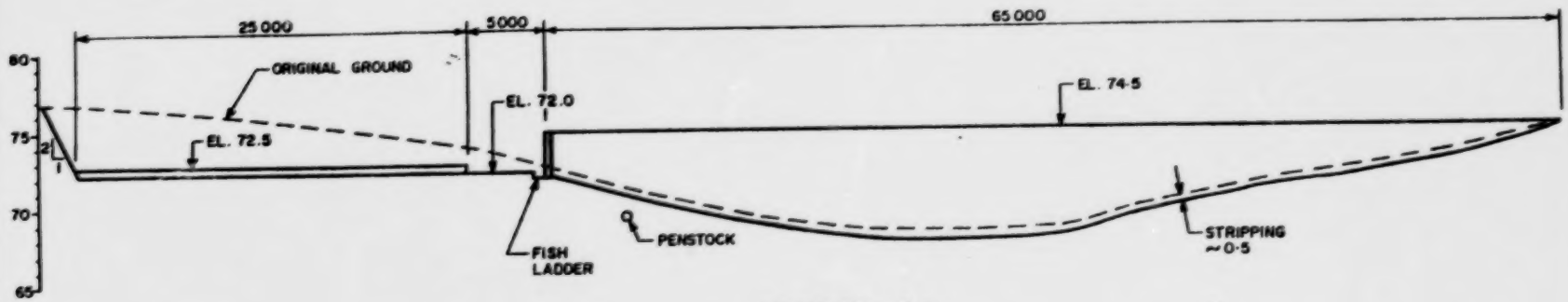


FENCO NEWFOUNDLAND LIMITED

GENERAL PROJECT LAYOUT
PLAN AND PROFILE

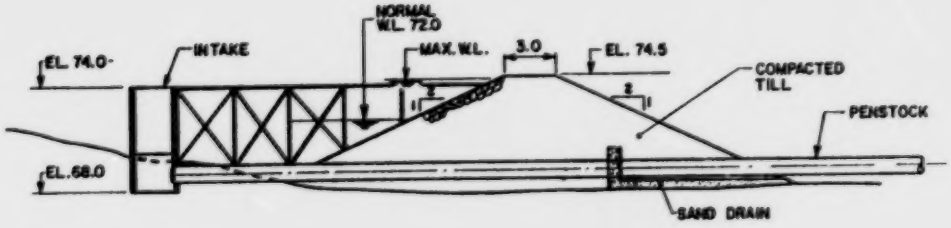
FIGURE 6


FLOW
INTAKE
B
EXCAVATE
EL 72·0
PENSTOCK
C
C
A
A
FISH
LADDER
B
0
10
20m
FENCO NEWFOUNDLAND LIMITED
INTAKE DAM
PLAN
FIGURE 7



SECTION -AA-
SCALE 1:250

SECTION -CC-
SCALE 1:50

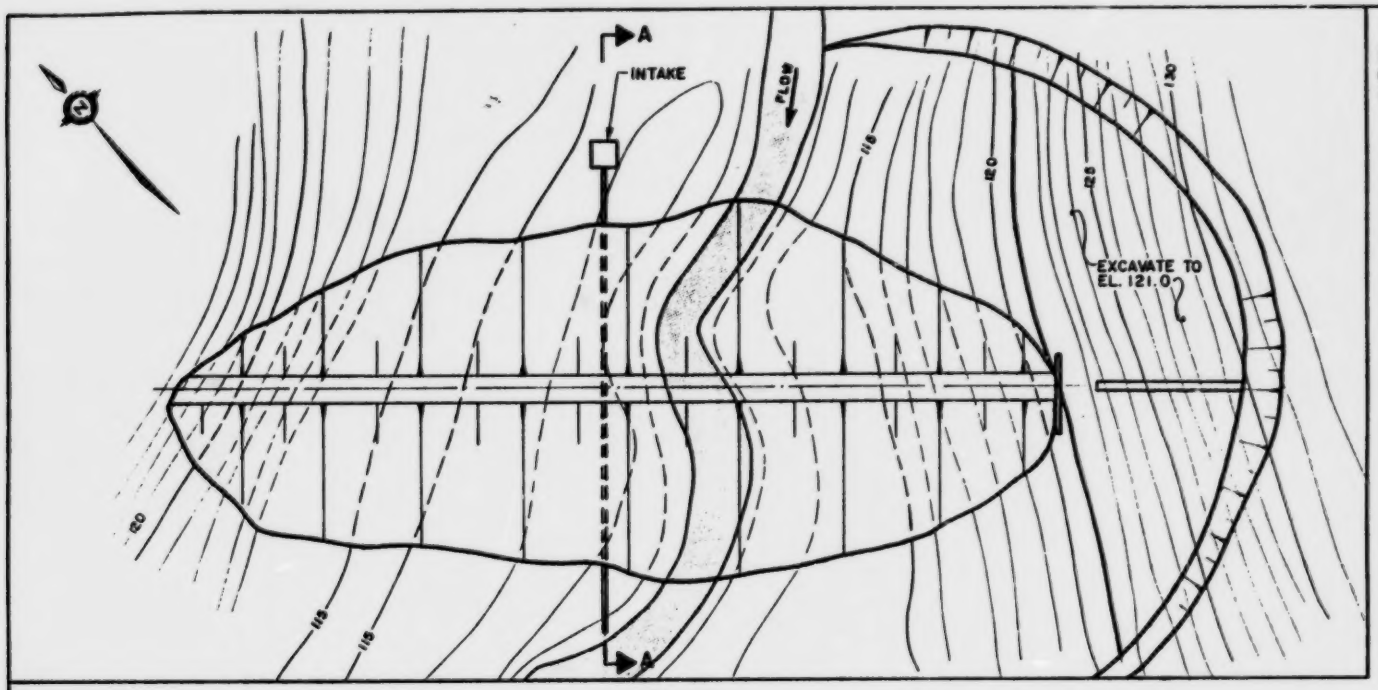


SECTION -BB-
SCALE 1:250

FENCO NEWFOUNDLAND LIMITED

INTAKE DAM SECTIONS

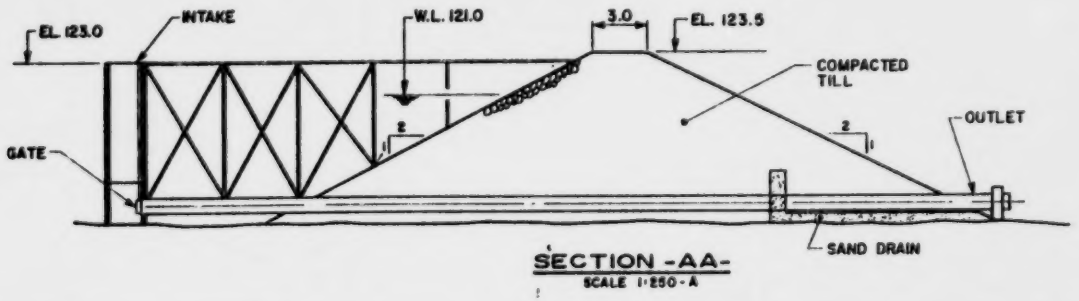
FIGURE 8



PLAN
SCALE 1:600-B

NOTE
Contours are inferred from limited data

0 5 10m A
0 10 20m B

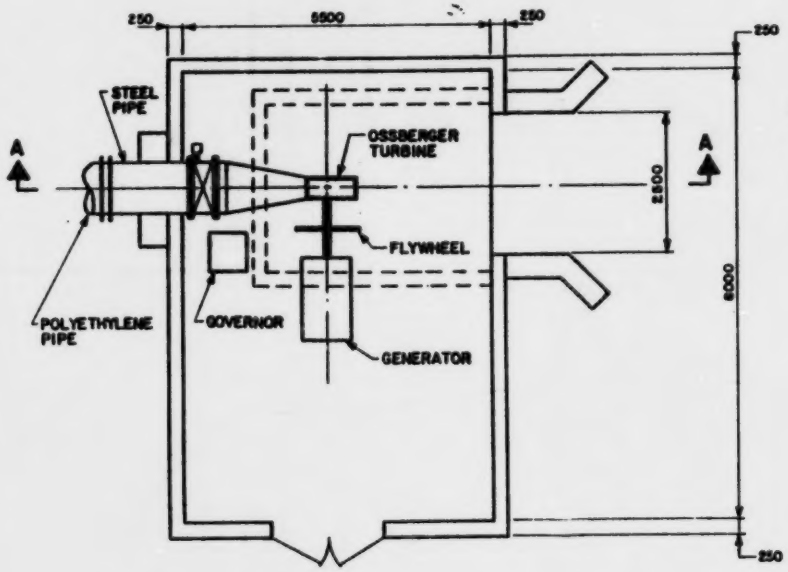


SECTION -AA-
SCALE 1:250-A

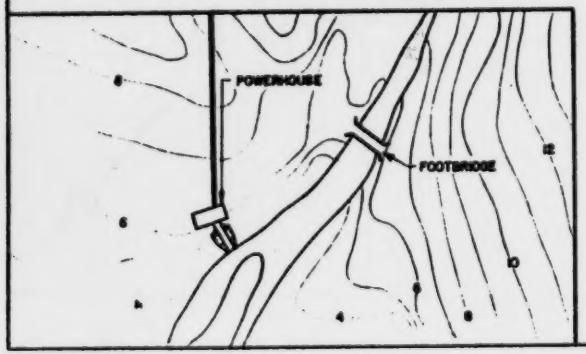
FENCO NEWFOUNDLAND LIMITED

STORAGE DAM
PLAN & SECTIONS

FIGURE 9

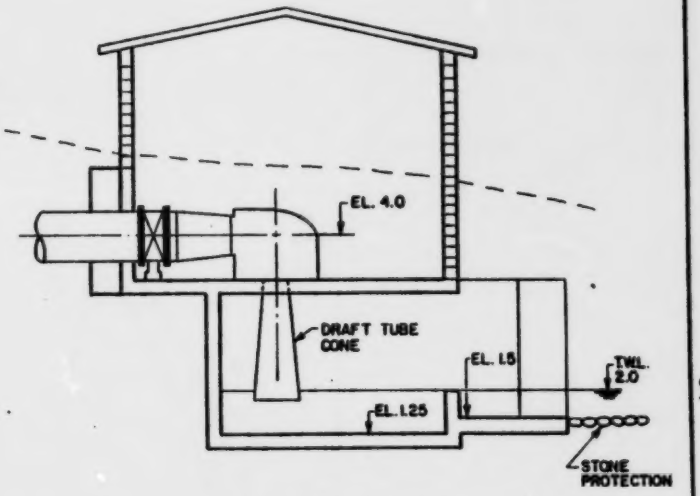


PLAN



NOTE

PENSTOCK DRAINAGE FACILITY NOT SHOWN



SECTION -AA-

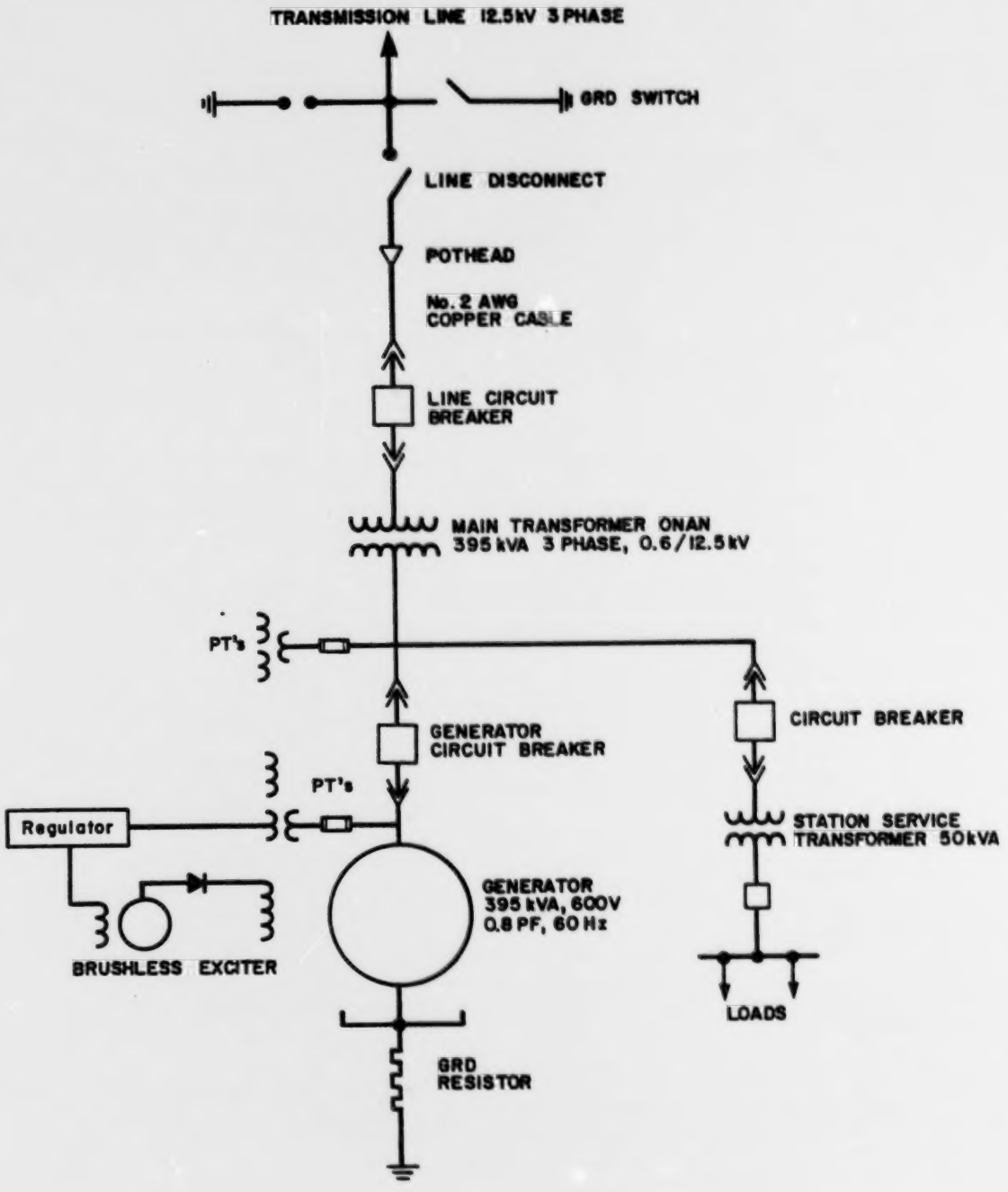
0 1.5 3m

FENCO NEWFOUNDLAND LIMITED

POWERHOUSE
314kW SCHEME

FIGURE 10

FIGURE 11



L'ANSE AU CLAIR
SINGLE LINE DIAGRAM
314 kW SCHEME

4. Economics

Essentially, a reduced scheme was considered to avoid upgrading the existing single phase transmission line between L'Anse-au-Clair and Forteau, a distance of 10.5 km. This would reduce the capital investment required to implement the project. However, it is realized that an upgrading of the transmission line would be a benefit to the utility because the existing poles are in need of replacement.

The proposed hydro plant will operate in parallel with the existing diesel generating system. The project evaluation is based on the economics of replacing diesel generation from existing units only.

Based on real and projected 1985 prices, the capital cost for the basic 314 kw run-of-the-river scheme is $1,579,640. This includes $240,000 estimated for upgrading the present single phase line from Forteau to L'Anse-au-Clair to three phase. (**Figure 12**).

Capital cost for completing the reduced 192 kw scheme is $1,124,920 including the transmission lines to the town's single phase distribution system, estimated at $30,000.

An analysis was carried out to determine the benefits of constructing a storage dam upstream (**Figure 13**). Storage cost and benefit comparisons show that while a storage reservoir would result in useful benefits, the economics of adding the facility are very marginal. It did suggest however, that if this project is developed further, storage options should be reexamined.

The projects were evaluated in terms on new hydro energy used to replace generation from diesel units, i.e., at the variable cost of diesel generation. No storage was considered. Based on these considerations, the basic evaluation of the hydro alternatives is based on direct comparison of hydro total and diesel variable generation costs, excluding escalation. This provided a direct measure of the mobility of the hydro projects as a function of interest rates.

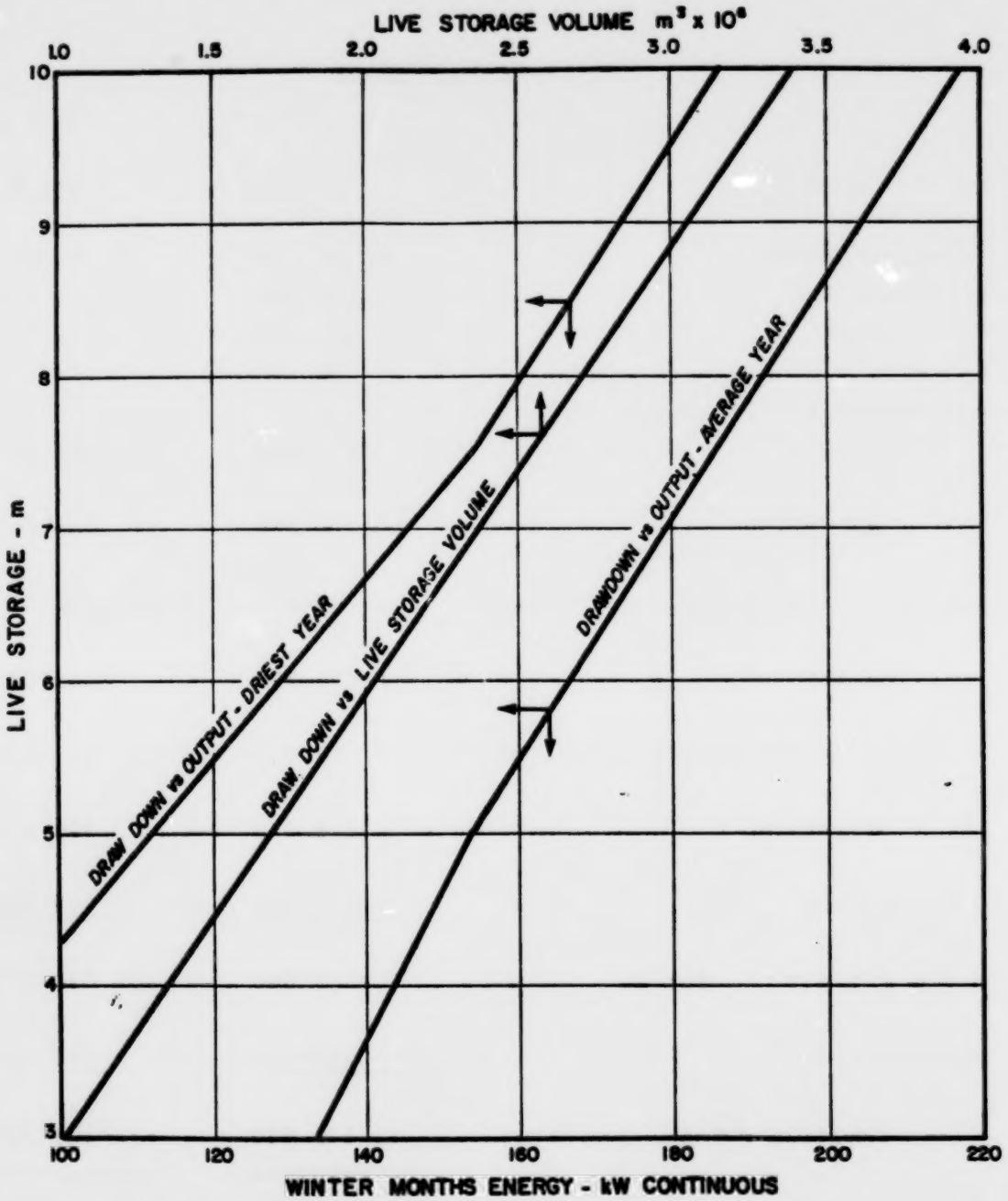
The calculation of unit hydro electric generation costs is based on capital-related charges of interest, depreciation, interim replacement, insurance, actual operation and maintenance costs, general administration, and overhead.

Fig. 12

CAPITAL COST SUMMARY

Item	314 kW	192 kW
1. Access Roads	$ 97 000	$ 97 000
2. Intake Dam	179 900	175 700
3. Penstock	394 000	274 000
4. Powerhouse Civil	98 260	98 260
5. Powerhouse Electrical/ Mechanical	239 400	179 400
SUB-TOTAL	$1 008 560	$ 824 360
Indirect Construction Cost (5%)	50 430	41 220
SUB-TOTAL	1 058 990	865 580
Engineering and Owners Cost (15%)	158 850	129 840
SUB-TOTAL	1 217 840	995 420
Contingencies (10%)	121 800	99 500
Hydro Project Total	$1 339 640	$1 094 920
Transmission	240 000	30 000
PROJECT TOTAL	$1 579 640	$1 124 920

FIGURE 13



RESERVOIR STORAGE
VS
WINTER GENERATION

Based on a service life of 35 years, a comparison of these hydro generation costs with the variable of displacement values of diesel generation, which is 16.5 cents/kwh, yields the corresponding breakeven interest rates of:

	BREAKEVEN INTEREST RATES	
	314 kW	192 kW
Hydro plant only	14.7%	13.3%
Hydro plus transmission	12.3%	12.9%
Hydro plus transmission costs increased by 10%	11.1%	11.7%

(Figure 14, Tables 1 and 2)

The above values show that if transmission line construction costs are excluded, both the 314 kw and 192 kw schemes are quite attractive. With transmission costs added, both projects are still economically viable by accepted Canadian standards, based on the replacement of fuel criteria. The 314 kw project would displace more expensive diesel fuel; however, the reduced scheme feasibly is more attractive because of its low transmission capital costs.

The payback period was obtained from direct comparison of accumulated present worths of costs and benefits with and without escalation for discount rates of 10% and 15%

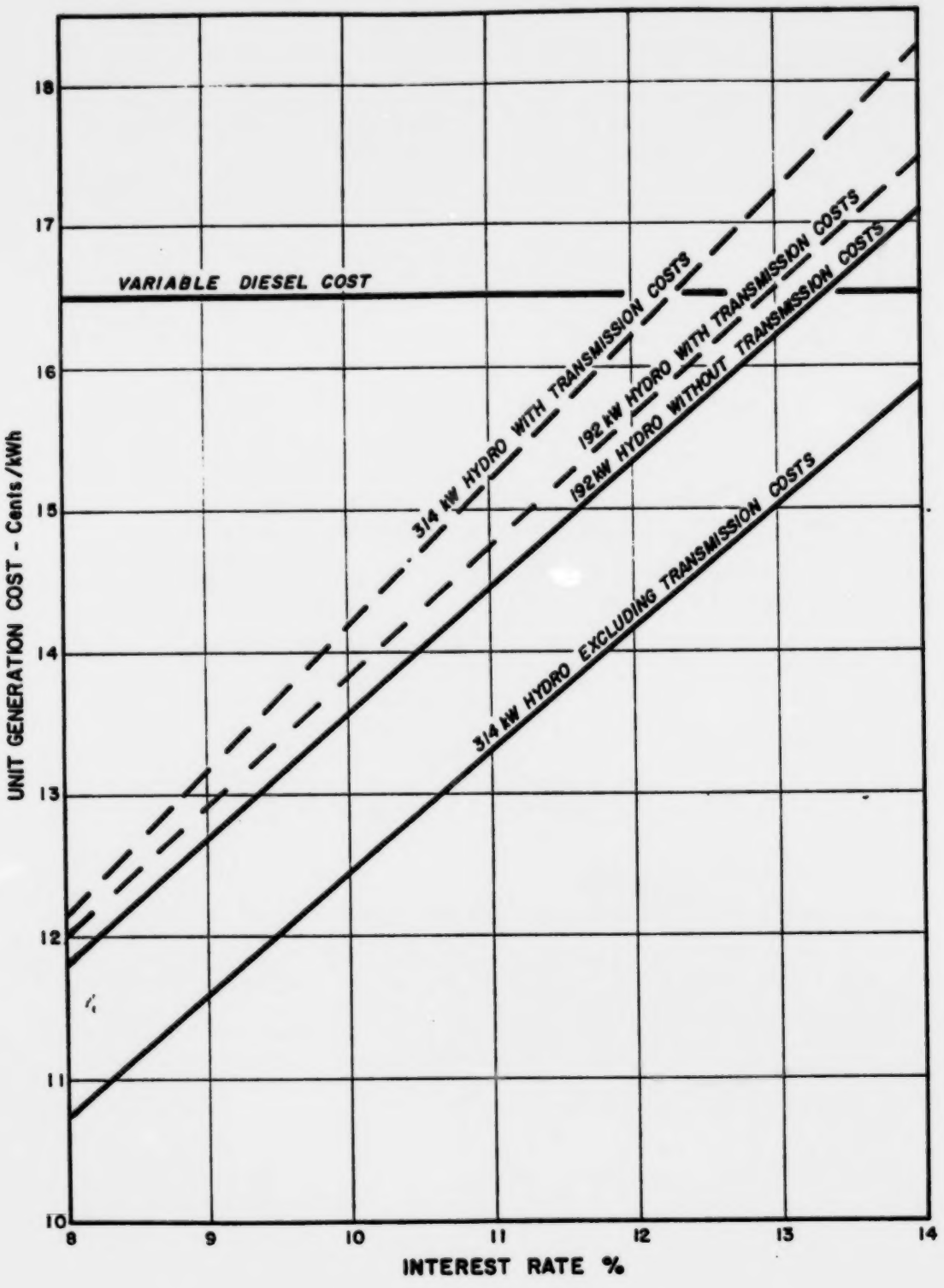
Payback Years

Discount Rate	10%	13%
Without escalation	1999 (12)	2004 (17)

5. Environmental Concerns

The only environmental concern was that expressed by the Department of Fisheries and Oceans. There is the possibility of a small run of sea trout in Eastern Brook and maybe some salmon parr and smelt. This was not supported by local residents. For the purpose of this study the Fisheries requirement to maintain a minimum of 25% of total streamflow at all times was followed. This of course reduces the utilization of streamflows so should therefore be investigated further by any party interested in the development.

FIGURE 14



UNIT GENERATION COSTS

TABLE 1

UNIT HYDROELECTRIC GENERATION COSTS - 314 kW SCHEME

Interest Rate	8%	10%	12%	14%
A. Hydro Project				
Annual Costs: $,000				
U.A.P.	114.94	138.92	163.84	189.43
O & M + Admin.	40.00	40.00	40.00	40.00
Insurance	1.34	1.34	1.34	1.34
Interim Replacement	2.95	2.95	2.95	2.95
Total	159.23	183.21	208.13	233.72
B. Transmission				
Annual Costs $,000				
U.A.P.	20.54	24.59	29.35	33.94
Other Costs	0.72	0.72	0.72	0.72
Total	21.31	25.61	30.07	34.66
Unit transmission cost ¢/kWh	1.45	1.74	2.04	2.36
Unit cost delivered energy ¢/kWh	12.28	14.20	16.20	18.26

Where:

Capital Cost Hydro	$ 1 339 640
Capital Cost Transmission	240 000
Average Energy after losses	1 470 000

TABLE 2

UNIT HYDROELECTRIC GENERATION COSTS - 192 kW SCHEME

Interest Rate	8%	10%	12%	14%
A. Hydro Project				
Annual Costs: $,000				
U.A.P.	93.94	113.54	133.91	154.82
O & M + Admin.	40.00	40.00	40.00	40.00
Insurance	1.09	1.09	1.09	1.09
Interim Replacement	2.41	2.41	2.41	2.41
Total	137.44	157.04	177.41	198.32
B. Transmission				
Annual Costs $,000				
U.A.P.	2.57	3.11	3.67	4.24
Other Costs	0.09	0.09	0.09	0.09
Total	2.66	3.20	3.76	4.33
Unit transmission cost ¢/kWh	0.23	0.28	0.32	0.37
Unit cost delivered energy ¢/kWh	12.09	13.83	15.63	17.48

Where:

Capital Cost Hydro	$ 1 094 920
Capital Cost Transmission	30 000
Average Energy after losses	1 159 000 kWh

Question and Answer Period - Mini-Hydro Studies

Question

Unidentified

The presenters have attested to the technical feasibility of their projects. Now I'd like to know if they're economically viable?

Answer

George Sturge, Newfoundland and Labrador Hydro

No. I don't think any of the projects would be economically attractive at the moment. They're really only marginally cost effective. They have payback periods of well in excess of 20 years.

Answer

C.E. Sheppard, Sheppard, Hedges and Green Ltd.

Of the three, the Rigolet project is marginally more cost effective.

Answer

Dale Courage, Fenco Newfoundland Ltd.

The L'Anse-au-Clair project is marginally feasible. Whether it would go ahead would be dependent on further analysis by Hydro. There has been interest shown in the project by a private investor.

Question

Nat French, Conference Chairman

Would a private company or a private investor be able to do it cheaper then say the utility with all the infrastructure it has to carry?

Answer

C.E. Sheppard, Sheppard, Hedges and Green Ltd.

Yes, if the developer was an engineer or an engineering firm he could absorb some of the inherent costs and treat those costs as part of his investment. There may be development regulations built into a public corporation's responsibilities that a private developer may not have to contend with.

Question

Bob Holmes, Holmes Engineering

Do either of the projects have other options, for instance the proximity of the Labrador in-feed? Would that not be a solution at least for the L'Anse-au-Clair project? Is there a prospect that the other communities might be hooked in at some time in the future?

Answer

George Sturge, Newfoundland and Labrador Hydro

It's doubtful that Hydro would tap the DC line for that area. There are a lot of technical problems involved. I suppose an AC cable across the old way might be a solution. The other bright hope for the area is Quebec and what that province is doing.

Question

Nat French, Conference Chairman

George, you're saying that the line from Churchill Falls would pass right over those communities and they wouldn't have access to it?

Answer

George Sturge, Newfoundland and Labrador Hydro

From a cost point of view, with present technology, it would be very, very costly, although these things are becoming more practicable from a dc point of view.

Question

Bob Holmes, Holmes Engineering

In terms of alternative energy systems for space heating, what other options are available to the three communities? Do the communities have a wood supply for space heating or are the people there being encouraged to use electrical energy, albeit from the diesel generators, for space heating?

Answer

Dale Courage, Fenco Newfoundland Ltd.

They're discouraged from using electricity for space heating. They basically use oil and wood for heating.

Answer

George Sturge, Newfoundland and Labrador Hydro

There's not a policy of encouraging the use of electricity because of the high cost of diesel. Electric heat would be very costly for the individual and I doubt that anyone would go to electric heating.

Answer

C.E. Sheppard, Sheppard, Hedges and Green Ltd.

In fact I don't think using electricity for space heating in those communities is permitted.

Question

John Evans, Newfoundland Light and Power

George Sturge referred to the benefits of joint development with regards to mini-hydro and water supply. Nobody mentioned the savings to the water supply system. I'd like to know what the benefits are for the water supply system. Also, does anyone perceive a time in the use of the water supply system, when that system would require so much of the water that the hydro plant would not be a viable option? Concerning the fish screens on the Rigolet project, will it inflict significant losses in the flow if the screen is small enough to keep small fish from going through? Finally, on the L'Anse-au-Clair project, looking at the topography of the area there would seem to be larger sites available. Since a town water supply wasn't mentioned in that study, why not look at a larger site with an eye to supplying power to neighbouring communities?

Answer

George Sturge, Newfoundland and Labrador Hydro

Regarding the benefits to a water supply, we looked at it from the point of view of joint development. If a water supply went ahead on its own it would not be able to share costs. The water supply would have to incur full costs.

Answer

C.E. Sheppard, Sheppard, Hedges and Green Ltd.

In terms of head losses across the fish screens, the flows to the turbine were so small that it wasn't a significant problem. Once your flows increased, the losses across the fish screens would become significant.

Answer

Dale Courage, Fenco Newfoundland Ltd.

In terms of the municipal water supply for L'Anse-au-Clair, they've recently completed a dam and a water supply system for the town, so water supply is irrelevant. We didn't consider a larger development site.

Question

Philip Graham, Department of Mines and Energy

I know for the Roddickton hydro project, that you (George Sturge), made quite an effort to use local contracting to cut your costs. Could the same thing be done for Mary's Harbour? If it were, do you have an estimate of possible cost reductions?

Answer

George Sturge, Newfoundland Light and Power

The costs we used are generally in line with what we experienced at Roddickton, taking into account the manpower and equipment available. There isn't a lot of equipment available at Mary's Harbour and there was a bigger labour pool to draw from at Roddickton. The best scenario would be for a contractor to go in, work quickly and get out again before winter.

Question

Bryon Bates, Galt Energy Systems

Were the three hydro project sites selected because they were deemed by the province to be the most feasible?

Answer

George Sturge, Newfoundland and Labrador Hydro

No. In the original inventory study done by Shawmont Newfoundland Ltd., Mary's Harbour wasn't one of the really promising sites.

Answer

Dale Courage, Fenco Newfoundland Ltd.

The L'Anse-au-Clair site was identified by the Shawmont study and it was well down on the totem pole. However, a different scheme was involved under that study and a different site.

Answer

George Sturge, Newfoundland and Labrador Hydro

Rigolet was identified but I don't know where it was ranked.

Answer

C.E. Sheppard, Sheppard, Hedges and Green Ltd.

The reason we went for Rigolet was the water supply situation. We knew that they needed a water supply and we looked at that as an opportunity to incorporate joint development.

Question

Bryon Bates, Galt Energy Systems

Assuming that the projects are economically feasible, what is the second biggest barrier in developing the sites?

Answer

George Sturge, Newfoundland and Labrador Hydro

Money.

Comment

Bryon Bates, Galt Energy Systems

That comment is very pertinent.

Comment

George Sturge, Newfoundland and Labrador Hydro

The projects may be economic, but are they a priority in terms of the total energy supply situtation? There are lots of things feasible but nobody is willing to go ahead right now.

Question

Bryon Bates, Galt Energy Systems

What would make them go ahead?

Answer

George Sturge, Newfoundland and Labrador Hydro

Lower capital costs.

Question

Bryon Bates, Galt Energy Systems

But I said assuming they were economic.

Answer

Dale Courage, Fenco Newfoundland Ltd.

I suppose it would be a case of the consultants' going out and selling the project, doing the required PR work to find investors.

Answer

C.E. Sheppard, Sheppard, Hedges and Green Ltd.

In terms of the financial aspect of development, one of the problems is that banks and mainstream lending institutions are not use to lending for these types of projects--projects on this scale. There is going to have to be a process of familiarizing and making bankers comfortable with these types of projects. Another problem involves the lack of familiarity with these types of projects on the part of regulatory agencies.

Answer

Dale Courage, Fenco Newfoundland Ltd.

I think there's also some reluctance in investing in small, isolated Labrador communities.

Comment

George Sturge, Newfoundland and Labrador Hydro

From Hydro's point of view, to proceed we would have to have some kind of investment incentive.

Comment

Bryon Bates, Galt Energy Systems

Issues that are very critical from a financial institution's point of view are buy rates for the power--an extended contract has to be in place--and their confidence in the revenue that is going to be generated and in the competence of the developer who is going to install the facility.

Question

John Evans, Newfoundland Light and Power

George, right now the PDD has a uniform rate for all of their diesel customers. What do you envisage in the way of local political problems once one of these small hydro sites is developed within a diesel serviced area? Will the locals expect cheaper rates and what will happen when those cheaper rates are not realized?

Answer

George Sturge, Newfoundland and Labrador Hydro

I can't anticipate what a community is going to think. I think Dave Collett addressed that yesterday when he said that any savings to Hydro's diesel system would have to go towards the reduction of the PDD's overall subsidy.

Comment

Unidentified

Community representatives here should understand--in view of the fact that a couple of the studies involved water supplies--that under the Municipalities Act, municipalities cannot participate in a hydro project.

Question

Tom Beresford, Department of Municipal Affairs and Housing

George? Based on your experience in Roddickton, would it be possible to say whether a hydro installation would require less maintenance and be more reliable than a diesel system?

Answer

George Sturge, Newfoundland and Labrador Hydro

I think that Hydro has a very good record as far as the availability of diesel power is concerned. When they're interconnected to hydro, the service tends to deteriorate a little bit because of the long lines and what have you. The advantage to a dual system is if one unit is down you can back up the service with the other unit.

Introduction - Wind Studies

Nat French, Conference Chairman

Our next presenter is Dave Hood of ShawMont Newfoundland Ltd. He's been involved in consultative work, power systems, control and protection in industrial and commercial electrical services. He's going to be talking about two studies that were undertaken by ShawMont under the RCDP. One was an assessment of the potential for wind energy conversion systems for the south coast of Newfoundland. The second study was a follow-on study that EMR later commissioned for the Labrador coast.

South Coast Study/Labrador Coast Study

Presenter: Dave Hood
Manager, Electrical Services
ShawMont Newfoundland Ltd.

Introduction

There are more than 79 remote communities in Newfoundland and Labrador which depend solely upon diesel generation for electrical energy and the majority may qualify for funding under the RCDP. This program is designed to sponsor feasibility studies and, subsequently, a limited number of demonstration projects to promote the awareness and adoption of alternative energy sources, technologies, and enhanced energy conservation schemes expressly for remote communities, in an effort to reduce the dependence of these communities on diesel fuel.

Within the proven alternative energy options available, Wind Energy Conversion Systems (WECS) rank high. However, with respect to interconnection in grid-isolated diesel systems there are still many unkowns and obvious constraints requiring further research and development. These constraints notwithstanding, it is still anticipated that given the very high costs of generating electricity from diesel fuel in most remote communities, WECS, in many instances, will be economically viable.

This presentation involves the pre-feasibility analysis of WECS installations in remote communities along the South Coast of Newfoundland and the WECS potential for remote communities on the Labrador coast.

Wind Energy Conversion Systems

Windmills have been used to harness wind energy for more than 1,000 years and probably much more, so the idea is not a novel one.

The earliest clear evidence of their use was found in the Middle East in Afghanistan and Persia. By the Middle Ages, windmills were widespread in Mediterranean countries and the type of design we know as the traditional Dutch windmill emerged. In their heyday, at the end of the 18th century, there were perhaps 10,000 in use in Holland and an equal number in Britain.

The traditional windmill commonly had four blades providing a lattice framework which the miller could cover with more or less canvas depending on the wind speed.

With a blade diameter of typically 25m, a windmill could deliver 30 kw shaft power with wind speeds of 7 m/s (25 km/hr or 15 mph). It would give an average power output of 10 kw corresponding to an energy output of 100 kwh per working day; equivalent to the work of a hundred men or a dozen horses.

During the 19th century, steam engines became more efficient and the use of windmills went into decline. This was hastened by the development of the internal combustion engine and the growth of electricity supply systems.

However, in the mid-1970s, the trend of declining fuel prices sharply reversed, and it is now accepted that the era of very cheap fuel has ended. In the search for alternative renewable energy sources, wind has emerged as one of the most, if not the most, promising source of renewable energy with the development of efficient, light, and robust wind machines which are proving to be more cost effective than the traditional windmills.

Wind is not, unfortunately, a reliable power source on a day-by-day basis but is reliable on a yearly basis. Therefore, to be a viable power source, wind power must, apart from a few specific cases, integrate with more conventional, controllable power sources and the degree of integration, i.e., level of penetration, holds the key to whether or not a particular WECS installation will prove feasible.

The major application for WECS today is in electricity generation, with most commercially operated WECS being integrated into large electrical grids. This mode of operation poses few operational problems as the contribution from WECS both in the quality and quantity of power cannot affect the system stability. Unfortunately, integration of WECS into small systems is far from being so straightforward, especially where high levels of penetration are necessary to save appreciable amounts of diesel fuel.

In the general case of a small grid-isolated system it is essential that diesel generation be maintained in parallel with the WECS to ensure that the quality and level of power supplies are maintained uninterrupted should the wind fail. At times of gusting winds, system stability may be a problem. Also, the higher the average wind turbine output the lower the average diesel load. Prolonged low load running increases diesel wear and maintenance costs and reduces engine life. Stack carbonization and bore glazing may result from lower running temperatures. In addition, the specific fuel consumption of the diesel will increase significantly, with reduced load below 40% rated output. Consequently, manufacturers generally recommend that diesels should not be run at lower than 40% rated output for extended periods of time.

As part of an experimental program to evaluate wind turbine performance on an isolated diesel power system, the Block Island Power Company on Rhode Island monitored a 150 kw WECS in parallel with two diesel generators; 225 kw and 400 kw. It was concluded that wind turbine generation, even when providing a large portion of the power required by an isolated community (up to 60%), can be a practical option resulting in system disturbances no greater than those found in conventional diesel systems. If these results are accepted, it follows that the total WECS output should never exceed 60% of the system load at any time. However, under gusting wind conditions, the ability of the governors of on-line generators to adequately respond to large and sudden swings in WECS output must be verified. If the governors are too slow and response times cannot be improved, it may be necessary to reduce the penetration levels accordingly. In a small system it will be necessary to control the WECS output and/or the load to ensure acceptable penetration levels. In a large system the full output of the WECS will be, by design, less than 60% of the system minimum load and no special controls will be required, assuming adequate governor performance.

Simply stated, the problem of integrating wind into a small system is one of matching the WECS output with both efficient diesel generation and the changing system load. As stated above, this is far from being straightforward and will require complex control systems.

South Coast Study

This study, commissioned by Newfoundland and Labrador Hydro in May 1984, was for a pre-feasibility analysis of installing WECS in 12 remote communities served by grid-isolated diesel generator systems: Petites, La Poile, Grand Bruit, Burgeo, Ramea, Grey River, Francois, McCallum, Recontre East, Petit Forte, Southeast Bight and Monkstown (**Figure 1**).

The study's objectives were to select wind sites, evaluate machines and examine the technical and economic feasibility of wind generation on these sites. The study generally comprised three components:

1. Site Assessment Methodology
2. WECS Evaluation/Selection
3. Pre-feasibility Analysis

1. Site Assessment Methodology

This essentially involved the development, testing and refinement of a site assessment methodology document to provide guidelines and procedures for the evaluation of remote communities in Newfoundland and Labrador for WECS potential. Although the procedure was applied to only the South Coast communities during this study, it was developed such that it is applicable to the province as a whole. The objective of this phase of the work was to derive a methodology that would permit disqualification of sites which have no potential, and the priorization of sites which appear to have potential, for further analysis.

The site assessment methodology basically consisted of evaluating each of the communities using a weighted matrix technique. The complete evaluation matrix for the South Coast communities is shown in **Table 1**.

Once developed, the procedure was tested, first as a desk study and then in the field, on the 12 South Coast communities in an effort to assess and refine the methodology and to select the three or four best communities for preliminary economic evaluations. The office and field results compared quite favorably, with the biggest discrepancies being with the access, connection distance, and topography criteria. These were subsequently modified to accommodate the differences and the three communities which showed the most potential and which were subsequently chosen for further analysis were Burgeo, Monkstown and La Poile.

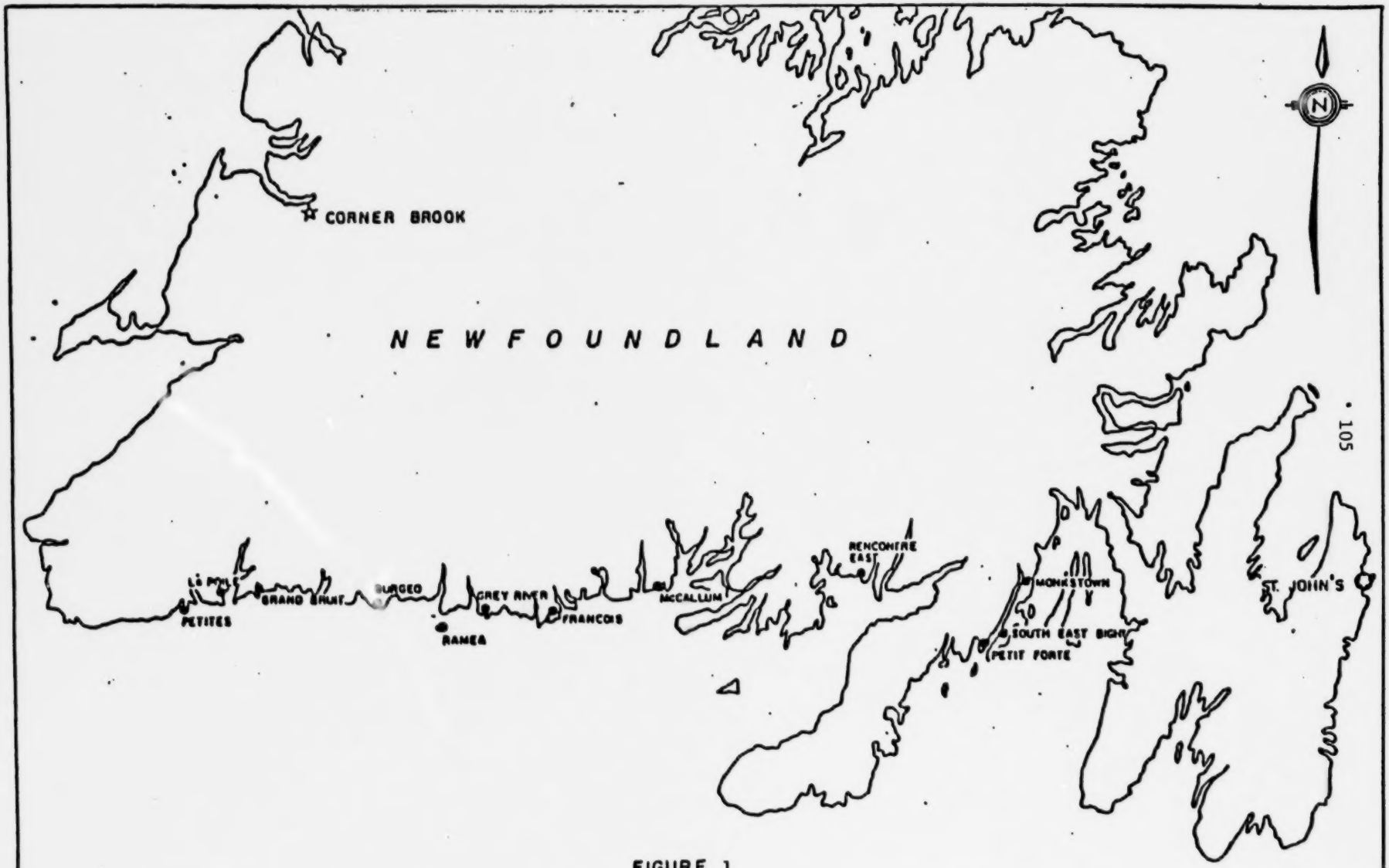


FIGURE 1

COMMUNITY LOCATIONS
SOUTH COAST STUDY

EVALUATION MATRIX

FINAL EVALUATION

TABLE 1

Weighting Categories		Wind Field	Topo-graphy	Safety	Icing	Soils & Geology	Skill & Equipment	Access	Social Impacts	Acquisition	Demo Visibility	EMI	Connect-ion Distance	Min. Demand	Total
Max. Weight		Yes/No	Yes/No/30	Yes/No	10	10	10	25	10	10	5	15	20	15	160
Community	Site No.														
Petites	1	Yes	No												
Petites	2	Yes	Yes/20	Yes	10	10	0	0	5	10	0	15	10	5	85
La Poile	1	Yes	Yes/20	Yes	10	10	0	10	5	10	0	15	15	5	100
Gr. Bruit	1	Yes	Yes/20	Yes	10	10	0	5	5	10	0	15	10	5	90
Gr. Bruit	2	Yes	Yes/20	Yes	10	10	0	5	5	10	0	10	10	5	85
Burgeo	1	Yes	Yes/20	No										15	
Burgeo	2	Yes	Yes/20	Yes	10	10	10	20	10	10	5	15	15	15	140
Ramea	1	Yes	Yes/20	Yes	10	10	10	0	10	10	3	10	15	15	113
Grey River	1	Yes	No												
Francois	1	Yes	No												
McCallus	1	Yes	Yes/20	Yes	10	10	0	0	5	10	0	0	15	10	75
Rencontre East	1	Yes	Yes/0	Yes	10	10	0	0	5	10	0	15	15	10	80
Monkstown	1	Yes	Yes/20	Yes	10	10	0	20	5	10	0	10	10	0	105
S. East Bight	1	Yes	Yes/20	Yes	10	10	0	5	5	10	0	10	10	0	80
Petit Forte	1	Yes	Yes/20	Yes	10	5	0	0	5	10	0	10	10	0	70

2. WECS Evaluation/Selection

The technical aspects of the study centred around the assessment and eventual selection of wind machines themselves. This phase of the work comprised an extensive market review of WECS, development of an evaluation/selection criteria for WECS relative to the parameters and constraints of remote communities in Newfoundland and Labrador, and application of this criteria to select the most suitable machines for operation on the South Coast of Newfoundland and throughout the province.

The market search identified some 119 WECS manufacturers who appeared to have potential with respect to this study, and these were subsequently contacted and information solicited. Concurrent with this process, an evaluation/selection procedure and criteria were developed which, by specific review and the application of weighting factors, would enable any machine to be readily assessed relative to Newfoundland remote community conditions (in fact, the criteria is general enough to evaluate and select machines for any application and circumstances with very little adjustment). Of the 44 responses received from the market solicitation, 26 were short-listed from preliminary evaluation for detailed assessment using the criteria. It was found that the information received was not nearly complete enough to permit application of the criteria and these manufacturers had to be contacted again, and this time provided with a questionnaire containing all of the criterion items. Completed evaluation questionnaires were returned by 15 manufacturers as listed in **Table 2.**

Based upon the technical feasibility of the respective diesel generating systems, **Table 3**, to support a WECS, the WECS chosen for analysis were:

Burgeo - various combinations of Carter 250 kw machines

La Poile - the 20 kw Windtech, 33 kw Aeroman and 25 kw Carter

Monkstown - the 25 kw Carter, 16 kw Northwind, 10 kw Jacobs, and the 33 kw Aeroman

3. Pre-feasibility Analysis

The final phase of the study involved a technical and economic pre-feasibility analysis of each of the three sites using the various alternative wind systems listed in the previous section. This analysis included the following activities:

TABLE 2

SUMMARY OF WEIGHTING FOR SUITABLE WECS

SOUTH COAST STUDY

Manufacturer	Model	Type	Rating	Weighting Points
Carter Wind System	25	HAWT	25 kW	12965
	250	HAWT	250 kW	10887
Enertech Corp.	44/40	HAWT	40 kW	12375
	44/25	HAWT	25 kW	11413
	21/5	HAWT	5 kW	9280
Wind Tech. Inc.	120	HAWT	20 KW	8137
	180	HAWT	80 kW	9003
DAF-INDAL	1300	VAWT	50 kW	11028
	6400	VAWT	522 kW	10198
M.A.N.-GHH (Canada) Inc.	Aeroman 12.5/33	HAWT	33 kW	10490
North Wind Power Co.	L-916	HAWT	16 kW	11016
Adecon Energy Systems Inc.	125	VAWT	125 kW	8175
F.D.O. Windenergie System	NEWGCS -25	HAWT	300 kW	8489
Moerup Industrial Windmills	60/17	HAWT	65 kW	11091
Howden Group Canada Ltd.	HWP 60	HAWT	60 kW	10925
	HWP 200	HAWT	200 kW	11147
	HWP 330	HAWT	330 kW	10925
Polymarin B.V.	Pioneer 1	VAWT	100 kW	8839
MH2 Windmaster	100/22	HAWT	100 kW	10486
	150/22	HAWT	150 kW	10560
	200/22	HAWT	200 kW	10436
Vesta Energy	V-15	HAWT	65 kW	10437
Extrawatt Inc.	Ex-30	HAWT	30 kW	6095

TABLE 3

COMMUNITY CHARACTERISTICS

SOUTH COAST STUDY

Community	Population	Diesel Generation			Load Characteristics			Energy Costs	
		No. of Diesels	Sizes (kW)	Total Output (kW)	Annual Energy (MWh)	Min. Load (kW)	Peak Load (kW)	*O & M Costs ($/kWh)	Fuel Costs ($/kWh)
Burgeo	2,504	6	2 x 500 2 x 1000 1 x 920 1 x 850	4,770	11,498	975	2,969	15.9	0.115
Francois	219	3	1 x 175 1 x 100 1 x 200	475	618	57	196	33.2	0.161
Grand Bruit	80	3	2 x 40 1 x 60	140	215	28	66	59.3	0.232
Grey River	234	3	2 x 136 1 x 60	332	452	30	141	43.5	0.168
La Poile	186	3	1 x 60 1 x 40 1 x 100	200	330	30	93	42.4	0.160
McCallum	243	3	2 x 136 1 x 60	332	471	46	146	30.4	0.132
Monkstown	112	3	1 x 40 2 x 60	160	270	15	113	54.0	0.193
Petites	108	3	2 x 100 1 x 60	260	303	26	105	69.2	0.192
Petite Forte	90	30	2 x 60 1 x 136	256	315	12	111	62.4	0.187
Ramea	1,386	6	2 x 300 1 x 442 1 x 426 1 x 568 1 x 1000	3,036	5,888	320	1,050	15.7	0.109
Rencontre East	230	3	1 x 60 2 x 136	332	738	54	202	32.9	0.135
Southeast Bight	115	3	3 x 60	180	180	10	54	58.2	0.185

* Incudes fuel costs

1) Derivation of an economic model that would best facilitate the economic analysis. An in-house derived life cycle cost analysis computer program was used.

2) A visit to each of the three selected communities to closely examine the site, obtain or confirm information, identify all constraints, and meet with diesel operators.

3) Selection of alternative WECS for each site.

4) Preliminary design of each site sufficient to develop concepts and permit derivation of cost estimates.

5) Preparation of reasonably accurate capital cost estimates for each site.

6) Inputting all cost and other financial data into the economic model and performing a detailed assessment of the outputs to determine the economic feasibility of each alternative for each of the three sites. Several of the alternatives chosen did materialize as being economically visible, (**Table 4**).

Due to the fact that annual average wind speed must be assumed for each site (from a study of data from AES stations along the South Coast), the overall economic assessments may not have been as accurate as possible in an absolute sense. They did however provide accurate cost estimates and a good measure of the economic range, as well as the relative economics between sites. This has dictated the potential viability of a WECS installation at the chosen sites and has formed the basis for assessing the viability of a demonstration project.

It is recommended that a demonstration project utilizing, intially, one 250 kw Carter machine (or equivalent) be carried out in Burgeo following a site monitoring program.

Labrador Coast Study

This study, commissioned by Energy, Mines and Resources, Canada, in November 1984, was to carry out a preliminary assessment of potential WECS sites and to identify a suitable wind turbine installation for each of the potential sites in 14 communities on the Labrador coast, (**Figure 2**). These communities are Nain, Davis Inlet, Postville, Makkovik, Rigolet, Paradise River, Cartwright, Black Tickle, Charlottetown, William's Harbour, Port Hope Simpson, Saint Lewis, Mary's Harbour and L'Anse au Loup.

TABLE 4

WECS ECONOMIC SUMMARY

SOUTH COAST STUDY

Site	Total Energy Rqmt.	WECS	Total Energy Available	% Energy Penetration	NPV $	ROI %	IRR %	BCR	TP Yrs	SP Yrs
Burgeo	Energy 11,498 MWh Demand Max 2969 kW Min 975 kW	Carter 1 x 250 kW	570,000 kWh	5%	72,558	15.96	14.72	1.12	16.13	9.04
		Carter 2 x 250 kW	1,140,000 kWh	10%	258,033	17.57	16.13	1.23	13.48	8.16
		Carter 3 x 250 kW	1,710,000 kWh	15%	443,508	18.18	16.65	1.28	12.71	7.87
Monkstown	Energy 270 MWh Demand Max 113 kW Min 15 kW	Jacobs 10 kW	23,529 kWh	8.7%	-59,574	5.67	6.53	0.4	>20	31.28
		Northwind 16 kW	39,900 kWh	14.8%	-72,540	7.11	7.12	0.5	>20	22.43
		Carter 25 kW	57,000 kWh	21.1%	5,980	15.08	14.42	1.06	19.32	10.19
		M.A.N. 33 kW	75,000 kWh	27.8%	42,308	20.2	18.44	1.42	11.57	7.46
La Poile	Energy 330 MWh Damand Max 93 kW Min 30 kW	Carter 25 kW	57,000 kWh	17.3%	-2,690	13.81	13.48	0.97	>20	11.33
		Windtech 20 kW	45,000 kWh	13.7%	-35,354	9.3	9.64	0.65	>20	17.34
		M.A.N. 33 kW	75,000 kWh	22.7%	9,427	15.48	14.71	1.09	18.87	9.86

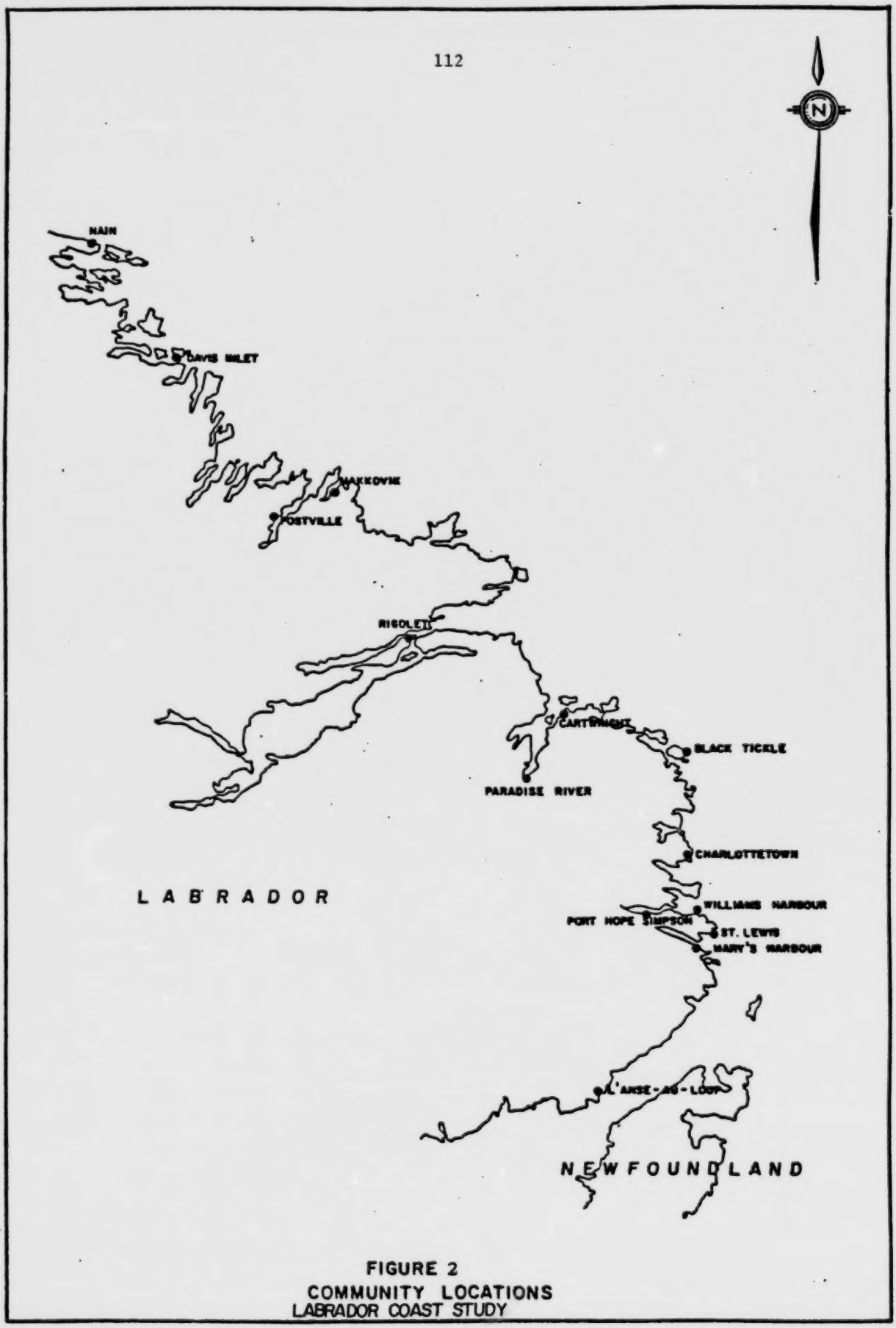


FIGURE 2
COMMUNITY LOCATIONS
LABRADOR COAST STUDY

The study comprised three components:

1) Collection, organization and evaluation of secondary source data

2) Matrix evaluation, site descriptions and selection of best sites

3) Technical review and selection of WECS machines

The site assessment methodology developed for the South Coast wind study, as well as data on wind turbines and wind integration experience accumulated in carrying out the South Coast study, were utilized extensively in the preparation of this supplementary report.

The assessment and evaluation of the communities, carried out as a desk study, identified six communities as having a site with potential to support a WECS installation with the following weightings, as outlined in **Table 5:**

Cartwright	115
L'Anse au Loup	115
Makkovik	105
Saint Lewis	105
Nain	85
Paradise River	85

The selection of WECS machines for each site was based upon the technical feasibility of the respective diesel generator systems to support a contribution from a wind turbine generator considering two modes of operation as outlined in **Table 6.**

The wind turbines were selected from the list of machines identified through the South Coast study.

The WECS selected for each site are as follows:

EVALUATION MATRIX

TABLE 5

LABRADOR COAST STUDY

Weighting Categories	Wind Field	Topo-graphy	Safety	Icing	Soils & Geology	Skill & Equipment	Access	Social Impacts	Acquisition	Demo Visibility	EMI	Connect-ion Distance	Min. Demand	Total
Max Weight	Yes/No	Yes/No/30	Yes/No	15	10	10	25	10	10	5	15	20	15	165
Community:														
Main	Yes	Yes/10	Yes	5	10	10	5	0	10	0	15	5	15	85
David Inlet	Yes	Yes/10	Yes	5	10	5	5	0	10	0	15	10	5	75
Postville	Yes	No												
Makkovik	Yes	Yes/20	Yes	0	10	10	5	10	10	0	15	10	15	105
Rigolet	Yes	Yes/20	Yes	5	10	5	5	10	10	0	10	0	10	85
Paradise River	Yes	Yes/10	Yes	5	10	5	5	5	10	0	15	10	5	80
Cartwright	Yes	Yes/20	Yes	5	10	10	10	10	10	0	10	15	15	115
Black Tickle	Yes	Yes/10	No											
Charlottetown	Yes	No												
William's Harbour	Yes	No												
Port Hope Simpson	Yes	No												
Saint Lewis	Yes	Yes/20	Yes	5	10	0	20	0	10	0	10	20	20	105
Mary's Harbour	Yes	Yes/20	Yes	5	10	0	10	5	10	0	0	20	15	95
L'Anse au Loup	Yes	Yes/20	Yes	5	10	10	10	5	10	5	15	10	15	115

TABLE 6

COMMUNITY DIESEL/WECS CHARACTERISTICS

LABRADOR COAST STUDY

Community	Diesel Plant No. x Size (kW)	System Min. Load (kW)	System Peak Load (kW)	Maximum WECS Contribution	
				Uncontrolled System (kW)	Controlled System (kW)
Nain	3 x 300 1 x 350	131	464	11	224
Makkovik	2 x 250 1 x 450	103	328	3	148
Paradise River	2 x 40 1 x 60	21	73	5	41
Cartwright	2 x 300 1 x 250	168	492	68	272
St. Lewis	2 x 136 1 x 220 1 x 75	50	261	20	143
L'Anse au Loup	1 x 1100 1 x 800 2 x 600	380	1728	140	968

Without Special Controls

Community	Minimum Rating for WECS	WECS Selected	
Nain	11 kw	Enertech	5,3 kw
		Windmaster	2,5 kw
Paradise River	5 kw	Enertech	5,3 kw
Cartwright	68 kw	Enertech	44 kw
		Moerup	65 kw
		Dafe-Indal	52 kw
		Howden	60 kw
St. Lewis	20 kw	Northwind	16 kw
		Windtech	20 kw
L'anse au Loup	140 kw	Windmaster	125 kw
		Polymarin	100 kw
		Adecon	125 kw

With Special Controls

Community	Minimum Rating for WECS	WECS Selected	
Nain	224 kw	Howden	200 kw
		Windmaster	215 kw
Makkovik	148 kw	Moerup	65 kw
		Howden	100 kw
		Windmaster	125 kw
		Vesta	78 kw
		Windtech	80 kw
		Polymarin	100 kw
		Adecon	125 kw
Paradise River	41 kw	Enertech	27 kw
		Man	33 kw
		Windtech	20 kw
		Extrawait	30 kw
Cartwright	272 kw	Howden	200 kw
		Windmaster	215 kw
Saint Lewis	143 kw	Moerup	65 kw
		Howden	100 kw
		Windmaster	125 kw
		Vesta	78 kw
		Windtech	80 kw
		Polymarin	100 kw
		Adecon	125 kw
L'Anse au Loup	968 kw	Howden	333 kw
		Carter	280 kw
		Dafe-Indal	522 kw
		FDO Stork	300 kw

Nat French, Conference Chairman

Some of you may have technical questions about the choice of wind machines in Dave's study. Some of the communities themselves may have questions as to how come their communities weren't ranked higher and so on. But we can get into that during the upcoming question and answer period.

Introduction

Nat French

The next presenter is Doug White. Doug is the manager of Fenco Newfoundland Ltd. He has a Bachelor of Science in Civil Engineering from the University of Toronto. His presentation concerns the St. Anthony study.

St. Anthony Study

Presenter: Doug White;
Fenco Newfoundland Ltd.

Fenco Newfoundland Limited was contracted by the town of St. Anthony to carry out a preliminary analysis of the wind energy potential within a 40 km radius of St. Anthony. The study was carried out under the RCDP.

The study was subdivided into five major tasks:

1. Preliminary Assessment of the Area
2. Field Trip and Site Investigation
3. Priorize the Sites Identified
4. Final Site Assessment
5. Final Report Production

St. Anthony is situated in northern Newfoundland and is the largest of the communities scattered along the Great Northern Peninsula, (**Figure 1**). In fact, it is the largest of the Newfoundland remote communities relying on diesel generators as its main source of energy.

A 6000 kw (firm) diesel generating plant located in St. Anthony provides electrical service to the town as well as a large number of communities in the region. The communities serviced are Boat Harbour, Cape Onion, Ship Cove, Cook's Harbour, Goose Cove, L'Anse-aux-Meadows, Noddy Bay, Quirpon, Raleigh, St. Anthony Bight, St. Carol's, St. Lunaire, Griquet and Wild Bight.

St. Anthony has a population of 3,107 (Census of Canada, 1981), and is considered the service centre for the most northerly communities on the island of Newfoundland.

St. Anthony, and more generally Newfoundland, lies in one of the highest wind power regions in Canada. The northeast coast of Newfoundland, the Northern Peninsula and Labrador all lie in extremely high wind density areas, (**Figure 2**).

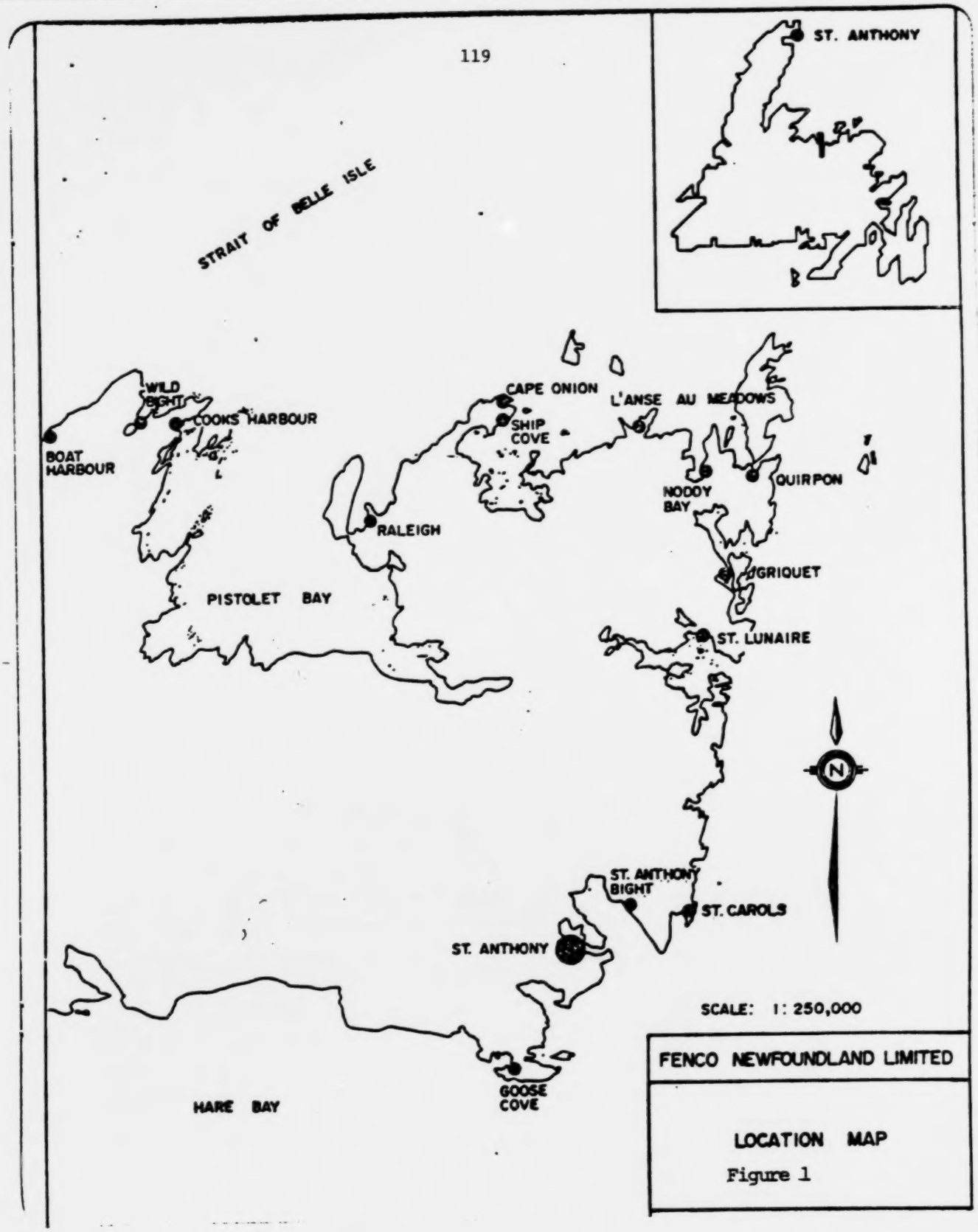

ST. ANTHONY
STRAIT OF BELLE ISLE
WILD BIGHT
COOKS HARBOUR
BOAT HARBOUR
CAPE ONION
SHIP COVE
L'ANSE AU MEADOWS
NODDY BAY
QUIRPON
RALEIGH
PISTOLET BAY
ST. LUNAIRE
ST. ANTHONY BIGHT
ST. CAROLS
ST. ANTHONY
GOOSE COVE
HARE BAY
N
SCALE: 1: 250,000
FENCO NEWFOUNDLAND LIMITED
LOCATION MAP
Figure 1

Figure 2

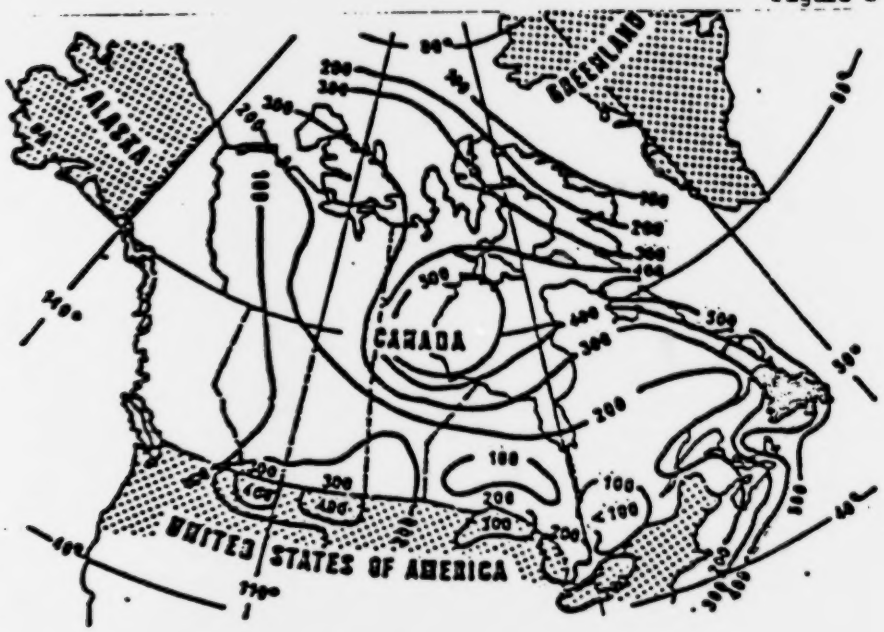


TABLE 2.1 WIND POWER POTENTIAL FOR CANADA, (MW). NETWORK AREA + 150 km

	POWER DENSITY W/m^2						
REGION	100-200	200-300	300-400	400-500	>500	>100 @ 30 DIA.	>100 @ 10 DIA.
YUKON	-	-	-	-	-	-	-
N.W.T.	1 600	1 900	-	-	-	3 500	31 500
B.C.	-	-	-	-	-	-	-
ALBERTA	3 700	1 200	300	-	-	5 200	46 800
SASK.	4 700	4 000	1 400	-	-	10 000	90 000
MAN.	1 380	5 600	2 300	830	1 760	11 870	106 830
ONT.	7 500	-	-	-	-	7 500	67 500
QUEBEC	8 500	3 500	-	-	-	12 000	108 000
N.B.	1 000	-	-	-	-	1 000	9 000
N.S.	-	1 000	280	20	-	1 300	11 700
P.E.I.	-	-	200	-	-	200	1 800
NFLD.	1 000	1 400	4 000	1 300	700	8 400	75 600
TOTAL	29 380	18 600	8 480	2 150	2 460	60 970	548 730

PRINCIPAL SOURCE: NATIONAL RESEARCH COUNCIL, CANADA, 1977

NOTE: DENSITY IS MEASURED IN W/m^2 AT 30 m HEIGHT
POTENTIAL BASED ON 30 & 10 DIAMETER SPACING BETWEEN WTGs

For the Preliminary Site Assessment, Fenco used an "Assessment Methodology" provided by EMR, Canada. In this assessment methodology, a decision matrix is developed to assist in making an initial investigation and deciding on the wind potential of a region and particular site(s) within that region. The methodology was designed on the basis of an evaluation matrix which permits the assigning of numerical values to relevant characteristics of potential Wind Energy Conversion Systems (WECS) sites such that the sites may be compared and the best site or sites chosen. The weighing values given to each category are based on that category's importance in regard to the applicability of a site to support a WECS. Points are awarded to the categories in the matrix according to the guidelines. Sites with the greatest point total are selected. Many of these categories are assigned weights in the preliminary assessment. Weights for the remaining categories are determined by a field visit to each of the initial proposed sites.

The Decision Matrix has 14 categories:

Windfield Potential

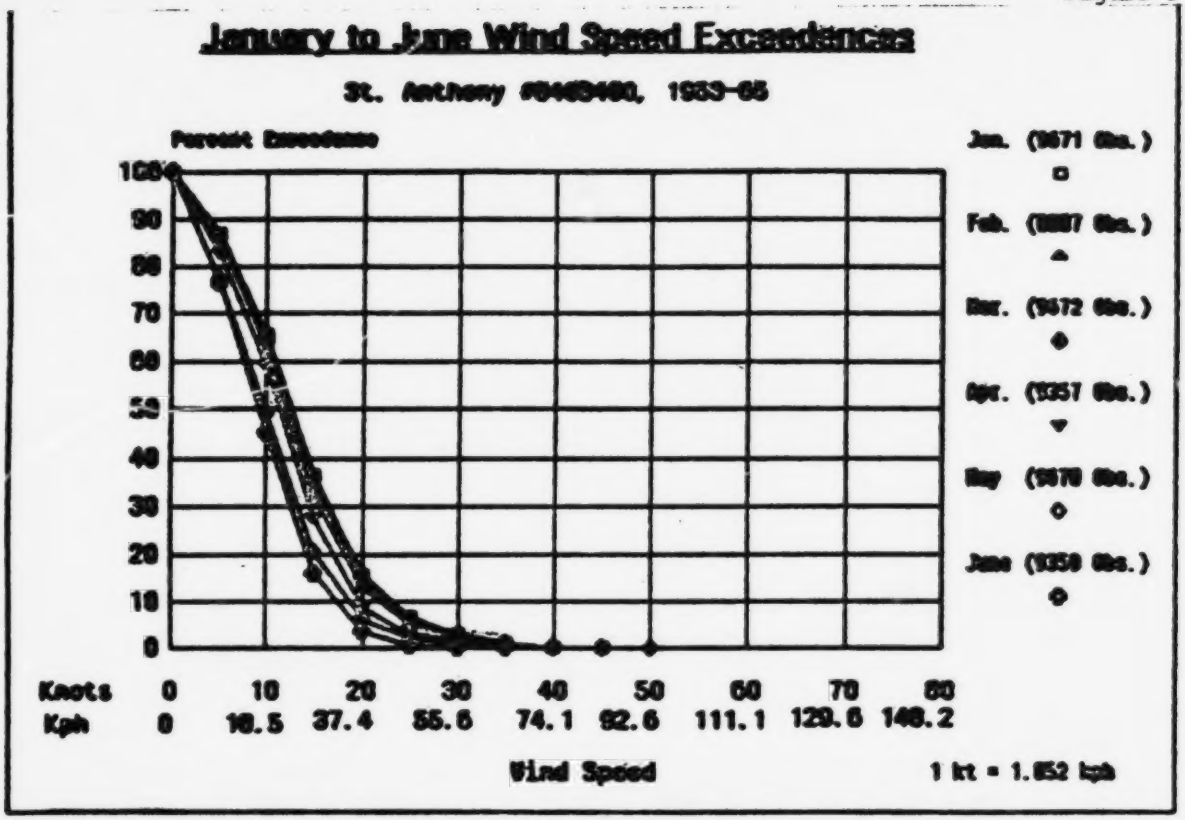
For assessing the windfield potential, historical wind data for St. Anthony were obtained. Long-term wind observation analyses for three St. Anthony stations were obtained through the Atmospheric Environment Service (AES) **LA**nd **ST**atistics database. Wind records collected by the Canadian Coast Guard at Cape Norman, NF, were also studied.

A number of graphs were prepared to illustrate and compare wind conditions for the various locations (**Figure 3**).

Figure 4 indicates that at two St. Anthony stations--#8403400 and #8403402--the minimum wind speed was greater than or equal to 20 kph (approximately 10.2 knots) for 56% of the time, while at station #8403401 for 70% of the time. **Figure 5** shows combined wind speed and direction distribution for the three stations from January to December.

Long-term wind statistics were only available for the area in general. Statistics for individual sites were not available. Hence, all sites were considered to have the same potential in the windfield category of the decision matrix. The average wind speed for the Belle Isle region exceeds the 12 mph (20 kph) minimum as specified in the assessment methodology. Consequently, each site was given a "yes" rating in the matrix for having sufficient wind resources to power a WECS.

Figure 3


January to June Wind Speed Exceedances
St. Anthony 05403400, 1953-65
Percent Exceedance
100
90
80
70
60
50
40
30
20
10
0
Jan. (1671 Obs.)
Feb. (1887 Obs.)
Mar. (1672 Obs.)
Apr. (1357 Obs.)
May (1670 Obs.)
June (1358 Obs.)
Knots 0 10 20 30 40 50 60 70 80
Kph 0 18.5 37.4 55.6 74.1 92.6 111.1 129.6 148.2
Wind Speed
1 kt = 1.852 kph

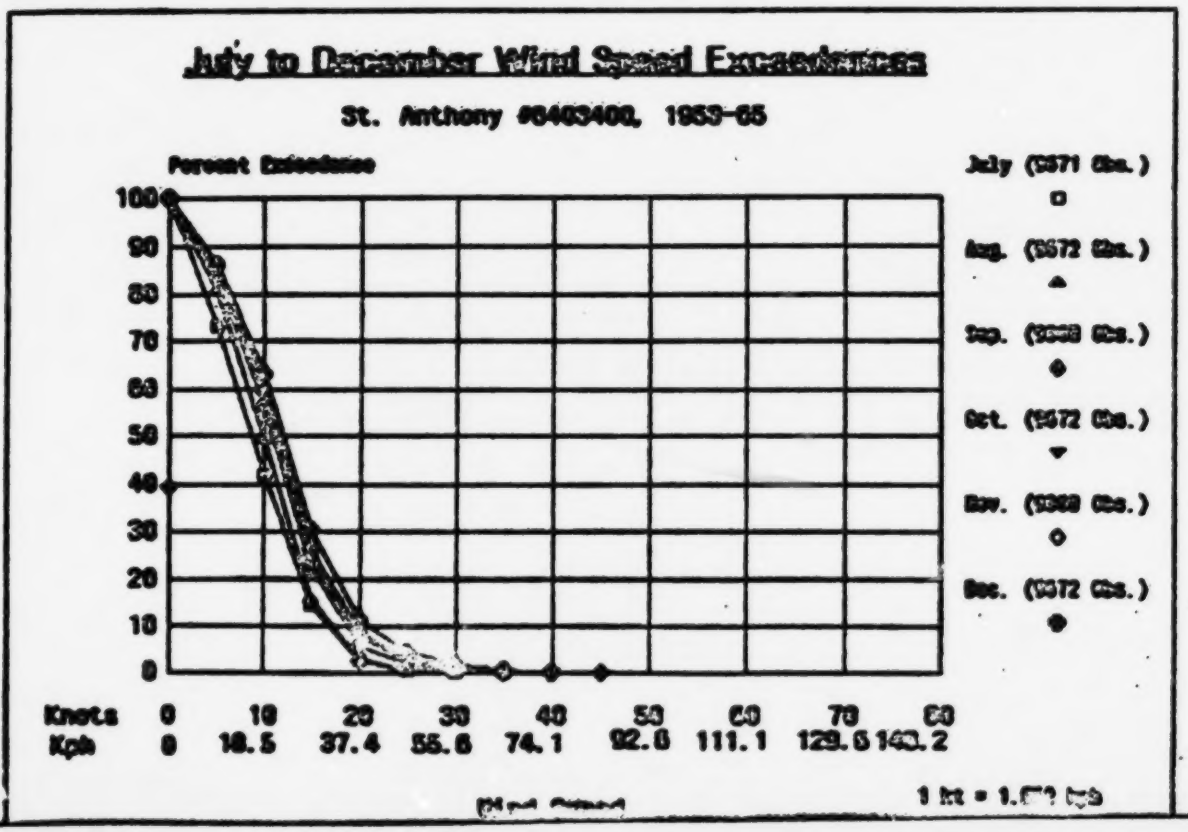

July to December Wind Speed Exceedances
St. Anthony 05403400, 1953-65
Percent Exceedance
100
90
80
70
60
50
40
30
20
10
0
July (1671 Obs.)
Aug. (1672 Obs.)
Sep. (1358 Obs.)
Oct. (1672 Obs.)
Nov. (1358 Obs.)
Dec. (1672 Obs.)
Knots 0 10 20 30 40 50 60 70 80
Kph 0 18.5 37.4 55.6 74.1 92.6 111.1 129.6 148.2
1 kt = 1.852 kph

Figure 4

January to December Combined Wind Speed Exceedences

St. Anthony #8403400 (1953-65), #8403401 (1970-84) and #8403402 (1988-84)

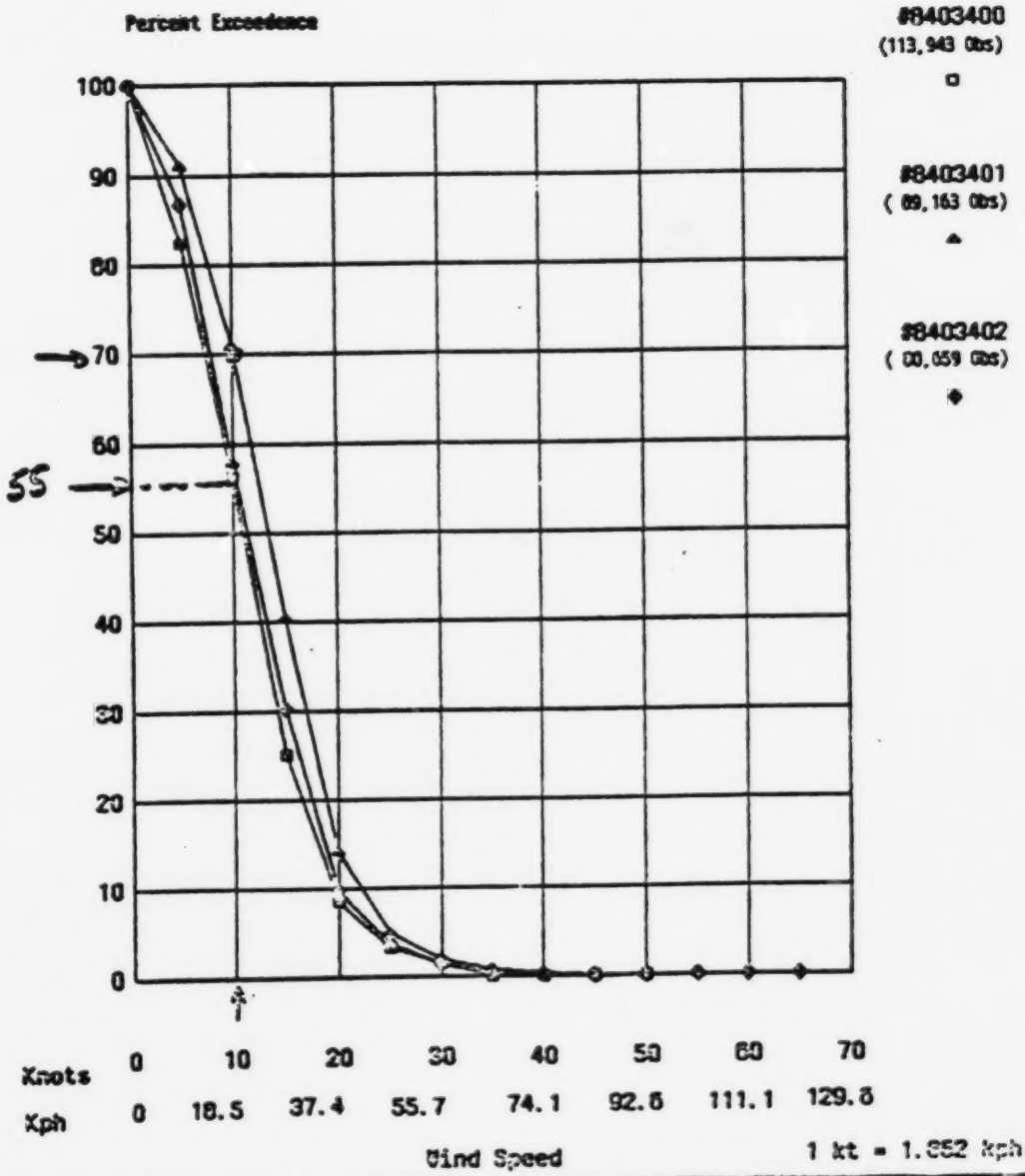
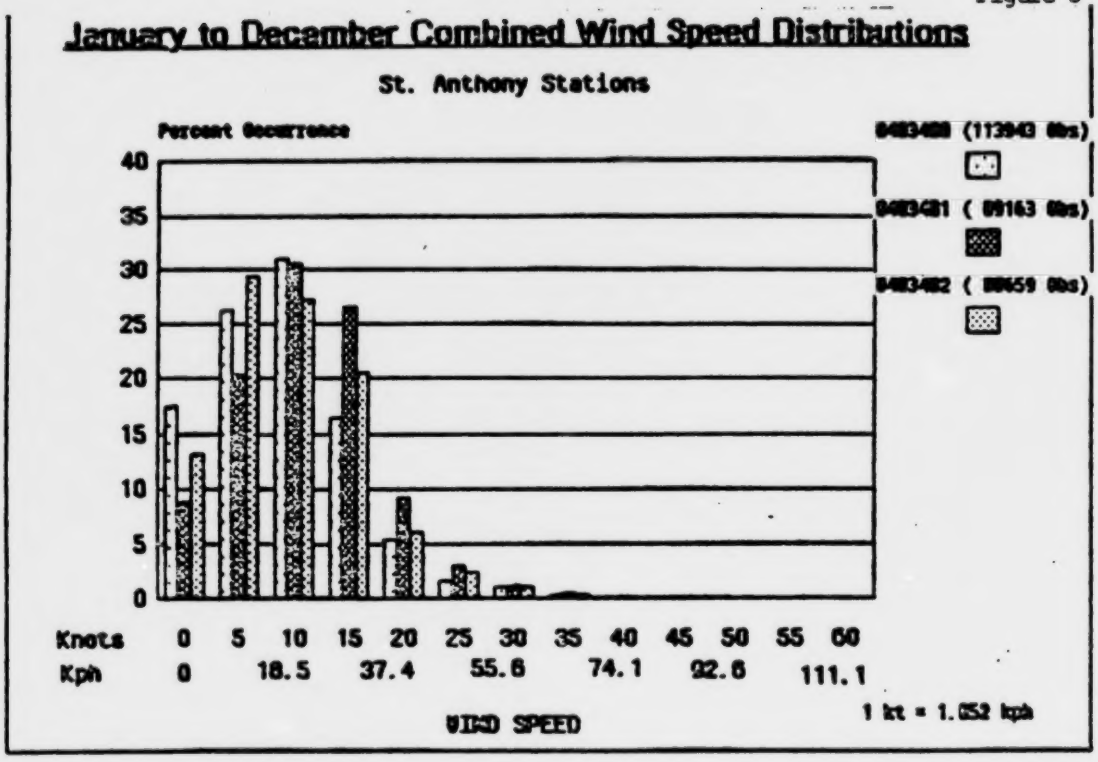
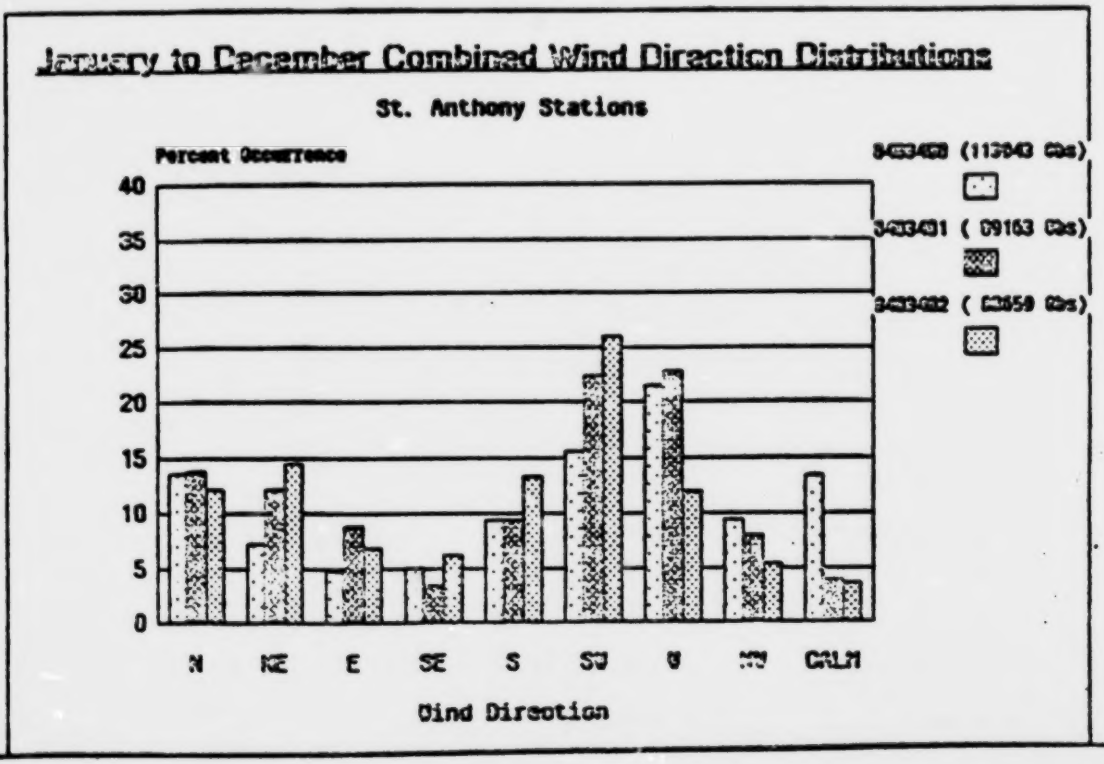


Figure 5


January to December Combined Wind Speed Distributions
St. Anthony Stations
Percent Occurrence
40
35
30
25
20
15
10
5
0
Knots 0 5 10 15 20 25 30 35 40 45 50 55 60
Kph 0 18.5 37.4 55.6 74.1 92.6 111.1
WIND SPEED
1 kt = 1.852 kph


January to December Combined Wind Direction Distributions
St. Anthony Stations
Percent Occurrence
40
35
30
25
20
15
10
5
0
N NE E SE S SW W NW CALM
Wind Direction

Topography

Topography is a very important consideration in site selection. For this assessment, the ideal site was considered to be on a hill with no terrain features within a 10 km radius that have a higher elevation. Such a site would be exposed to wind from all directions and the wind would be smooth flowing (low turbulence).

The province of Newfoundland has a rugged topography. Hills, ridges and mountains cover the countryside. Large, flat, open areas are rare in the province. It is extremely difficult to locate a site near roads, transmission lines that are easily accessible, and that is higher than the surrounding area in a 10 km radius. Most of our initial selections have higher points of land in the surrounding area. The purpose of the topography category is to anticipate how the obstruction will affect the windfield.

The allocation of points for the sites was based on two sources of information. Wind speed and direction distribution graphs for the region were plotted showing the prevailing winds (**Figure 5**). A 10 km profile was also plotted for each site through the highest point of land surrounding it. Topographic maps were used to draw the profiles. Here is the profile of the Goose Cove site (**Figure 6**).

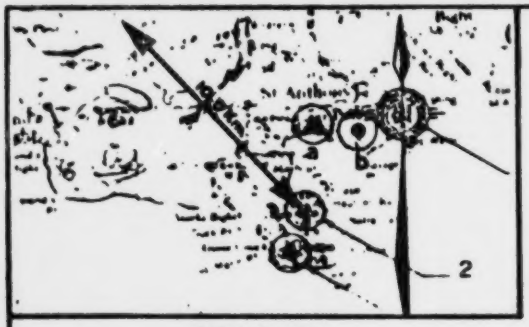
Safety Considerations

In designing WECS, there is an obligation to ensure the protection of the health, safety and welfare of others. Potential dangers include electrical shock, thrown ice, flying rotor blades, and the collapse of the structure. A fence surrounding the site will significantly reduce the risk of accidents. However, it is also recommended that a WECS site be situated at least 750 ft. away for the nearest dwelling. All of the initial sites were chosen such that the nearest dwelling was a minimum of 750 feet away.

Icing

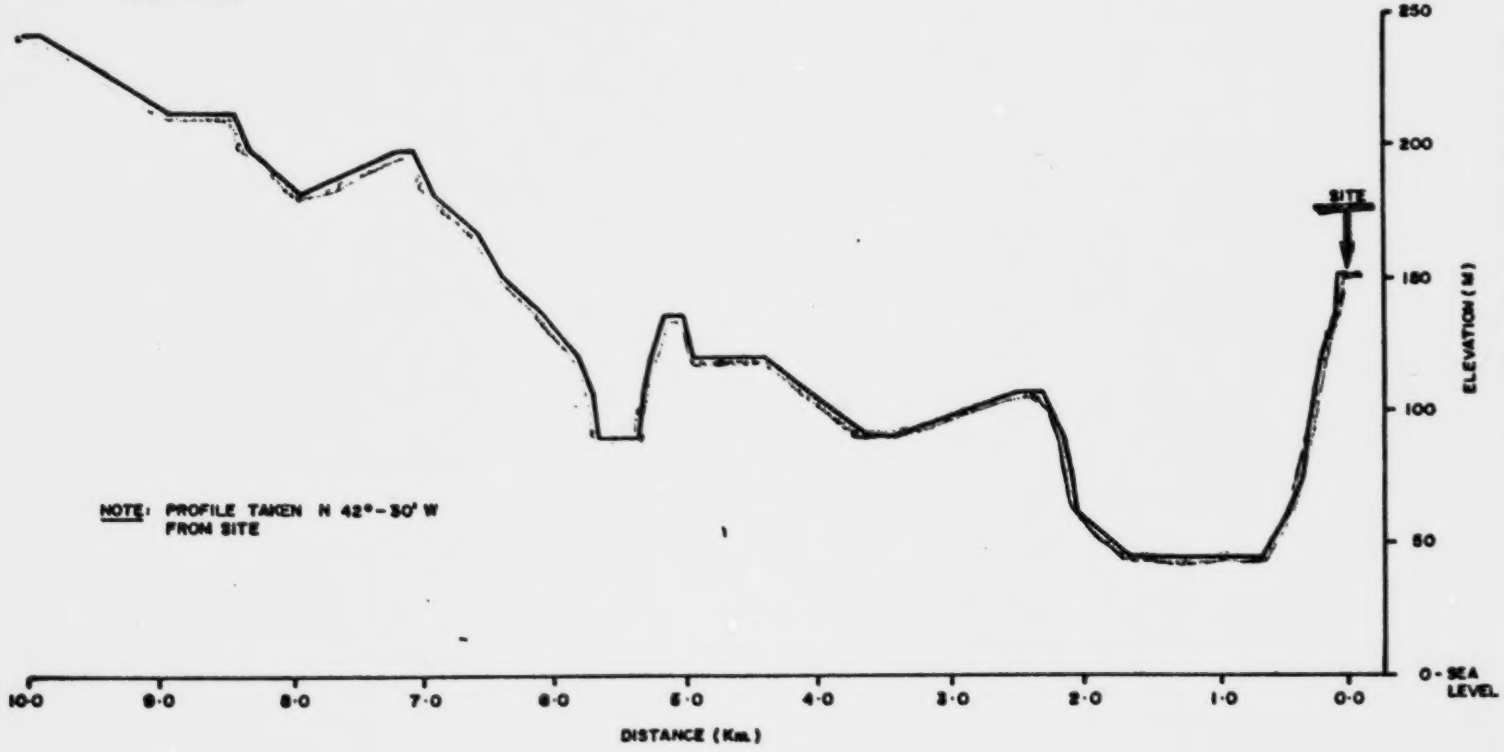
Atmospheric ice accretion on wind turbine blades, towers and transmission lines can affect the efficiency and continuous operation of the installation, and, if of significant severity, may cause structural damage. There are two kinds of atmospheric icing: rime ice caused by freezing fog or frost, and glaze ice caused by freezing rain or drizzle.

Historical information on icing for the St. Anthony area was obtained through AES in the form of freezing precipitation analyses and also through Newfoundland Hydro in the form of ice observation logs.



SITE PLAN

PROFILE ANALYSIS
SITE NO. 2
GOOSE COVE NO.2
THREE MOUNTAIN SUMMITS



NOTE: PROFILE TAKEN N 42°-30' W FROM SITE

Figure 6

Freezing precipitation and potential icing buildup occurs from December to April, with March being the worst month overall.

Figure 7, also from the AES, shows an isotimic chart illustrating average number of hours of freezing precipitation per year. The St. Anthony region falls between twenty-five and fifty hours.

It appears icing is a potential hazard in the St. Anthony area; however, it is much less than in other parts of the province. A WECS may have to be shut down for short periods of time if excessive icing occurs. Since icing information is only available for the area as a whole, each site scored the same point value for this item in the decision matrix.

Soils and Geology

The geology of a site is a necessary consideration in site selection since it determines the ease with which a WECS can be constructed. Topographic maps and aerial photographs provided this information for the preliminary study. Confirmation was made, where possible, during the field visit. Snow cover caused visual restriction in many cases.

There are four basic types of surface conditions found in the province--thinly covered bedrock, till, bog, and forest. Smooth bedrock is ideal for a WECS site since site preparation is limited and no major foundation work is required. Construction on till requires site preparation and foundation. Bog is less favorable since in site preparation it will have to be removed and, in some areas, replaced by more suitable material. Site selection in a forested area was avoided since higher towers are required in order to reduce the sheltering effect and turbulence caused by the surrounding trees.

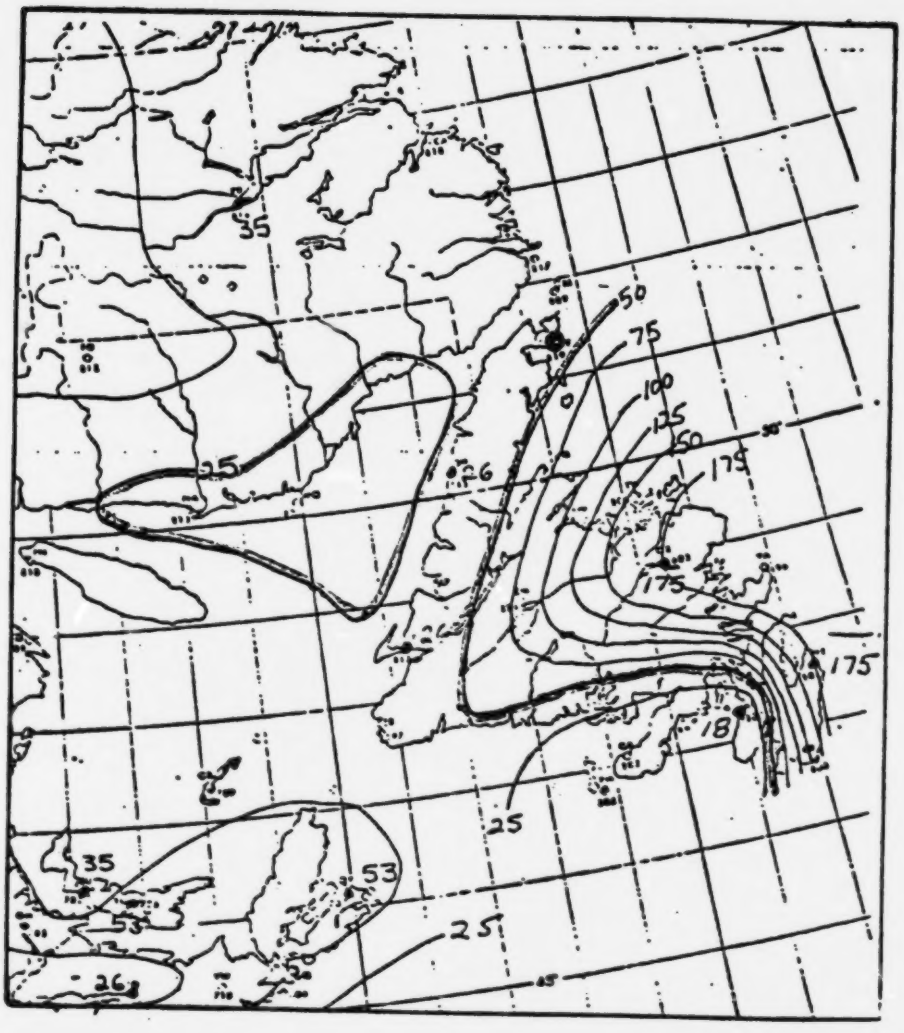
Equipment and Skill Availability

This was not a major problem in choosing the best sites from the initial selection. Heavy equipment, skilled operators and labourers are readily available in the town of St. Anthony and surrounding areas. Furthermore, all sites are a short distance by road from the town. Therefore, in evaluating this item in the decision matrix, all of the initial sites were judged to have all necessary equipment and skill available.

Site Access

With the exception of the available wind resource, site access may prove to be the most important factor in final site selection. Road construction to a site often plays a fundamental role in determining the economic feasibility of any project.

Figure 7



Isotimic Chart depicting average number of hours of freezing precipitation per year in the Atlantic Provinces.

For the purpose of this study, all of the proposed areas were considered to have equal accessibility by sea, road, and air. This is primarily because any two sites are separated by less than an hour by road. As a result, the only concern in this evaluation was whether or not an access road must be constructed to the specific site.

A rough cost estimate was made for the construction of access roads to each of the sites. The estimates were based on topographic maps (scale 1:50,000), aerial photographs, and site photographs from the field visit.

Social Impacts

Social impacts associated with the construction and installation of a WECS should prove to be positive. Short-term jobs for operators and labourers should result from road construction and tower erection. Long-term jobs will be created for the operation and maintenance of such a system, particularly if more than one WECS is installed.

The St. Anthony area is largely underdeveloped with the majority of the hills and ridges along the coast remaining undeveloped. Local residents may not be pleased with the aesthetics of such a project if it were poorly situated. Safety may also be a concern of the residents. However, if the system is carefully designed, the positive economic and social benefits will outweigh these potential negative impacts.

Social impacts in all areas of the study are expected to be similar since we are dealing with a small interconnected area rather than a group of remote and isolated communities. Consequently, all sites were awarded the maximum points.

Acquisition of Land

This is of prime importance in final selection of sites. In most cases, the site was on Crown land which is readily available for lease or purchase. Costs for such acquisition are minimal.

Demonstration Visibility

Demonstration visibility is important in this study because the project may be the first of its kind in the province. However, this item is not a deciding factor in the matrix evaluation. We are dealing with a small region in which each area is easily accessible by road, thus each site can be considered to have equal demonstration visibility.

Electromagnetic Interference

A WECS is a potential source of electromagnetic interference, primarily in microwave and television interference. For example, medium and large systems with metal blades may scatter television signals and interfere with local television reception. Sites can only be selected if they are not in a direct line of transmission.

The locations, (**Figure 8**), of all transmitting and receiving towers in the region were obtained from the Canadian Coast Guard and the Department of Communications. Possible interference will depend on several factors, including the type of WECS to be erected and the materials used in rotor construction.

The line of transmission was estimated for the purposes of this matrix evaluation. Further study will be required to determine the possible interference.

Connection Distance

The connection distance is the length of transmission line that is required to connect the WECS to the existing distribution lines. This is another important factor in economic feasibility determination. For the purpose of this evaluation, we assumed that the line will follow the access roads, and thus site conditions are not critical in transmission line construction. The distances were obtained from 1:50,000 topographic maps.

Minimum System Demand

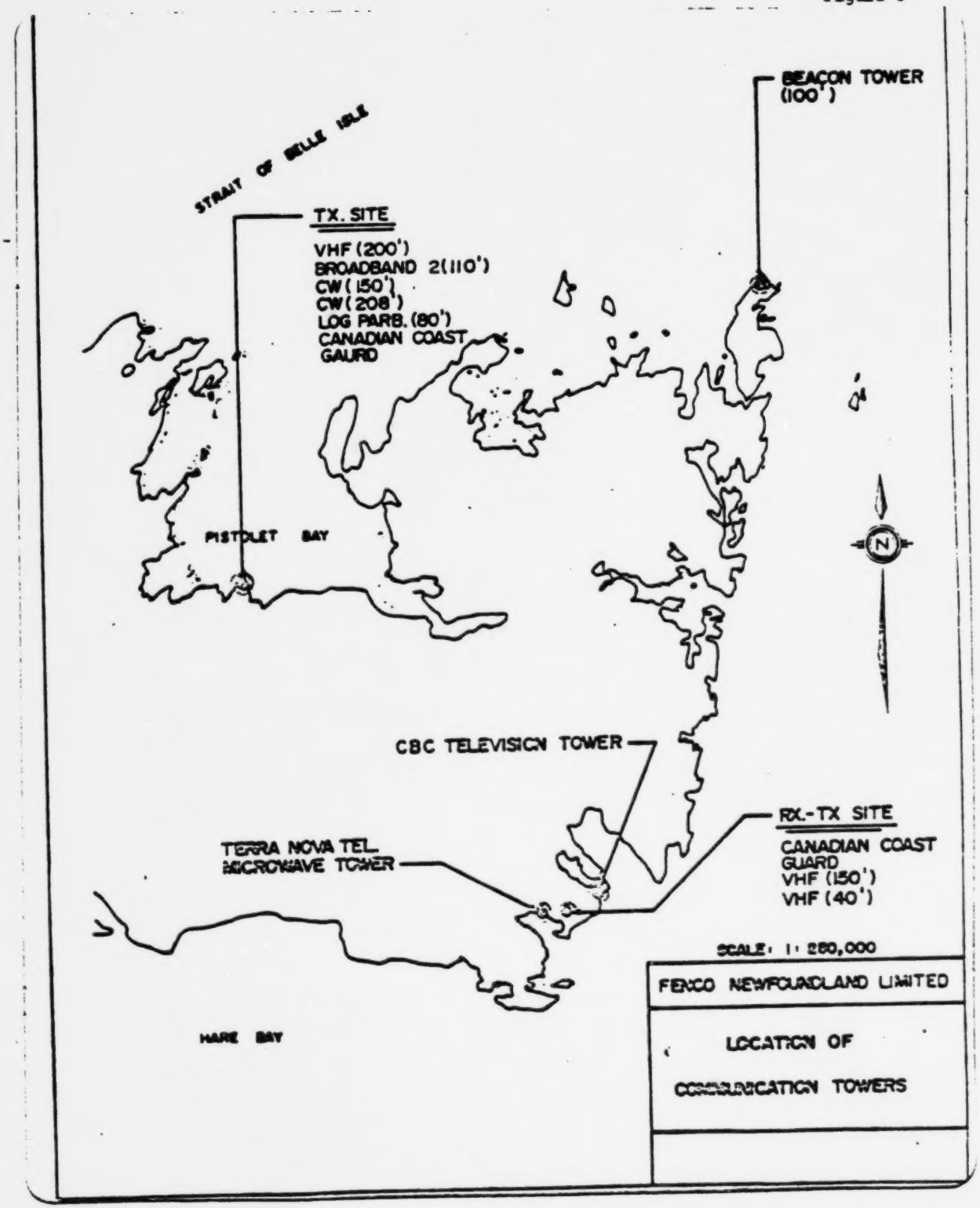
Minimum system demand is another item in the matrix that was not a deciding factor in the evaluation. This was because all areas in question are on the same electric grid, where the minimum load is 1500 kw, and hence, much higher than the 60 kw specified in the assessment methodology. As a result, each site was awarded the maximum point score.

Wind Farm

The St. Anthony diesel plant, with a firm capacity of 6 MW, provides electricity for many communities in the region. Consequently, the minimum system demand is quite high. As a result, a number of wind systems could be utilized to reduce the demand on diesel generated energy.

It may prove to be advantageous to construct several WECs in the area. Often it is more feasible to construct several small units than one large one. Such a site, containing more than one unit, is called a wind farm. The size of the proposed site was considered in this study in the event that a wind farm proves to be viable.

Figure 8


BEACON TOWER
(100')
STRAIT OF BELLE ISLE
TX. SITE
VHF (200')
BROADBAND 2(110')
CW (150')
CW (208')
LOG PARB. (80')
CANADIAN COAST
GAURD
PISTOLET BAY
N
CBC TELEVISION TOWER
RX.-TX SITE
CANADIAN COAST
GUARD
VHF (150')
VHF (40')
TERRA NOVA TEL.
MICROWAVE TOWER
SCALE: 1: 250,000
FENCO NEWFOUNDLAND LIMITED
LOCATION OF
COMMUNICATION TOWERS
HARE BAY

Fuel Costs

The site assessment methodology from EMR suggests that unit fuel cost for each community be used as a biasing tool to decide between sites of similar weighing scores, to assist in determining whether a community with a relatively low score may have some potential on the basis of cost savings, and to provide a feel for the expected economics of an installation. The higher the cost of fuel, the more economical the installation will be and the more attractive the site will be for a WECS installation. It also suggests that this cost parameter not be weighed but rather be applied as necessary as a bias after the sites have been otherwise evaluated.

In the case of site assessment for the St. Anthony area, this rationale was not applied. The energy produced by a WECS from any of the sites will be feeding into the same grid and no differential fuel costs are involved.

The cost of producing electrical energy from diesel power is expensive in comparison to other modes of operating. In the final economical feasibility analysis for deciding whether or not to install a WECS on a particular site, the cost of diesel fuel will be one of the principal parameters used.

Initial Site Selection (**Figure 9**)

The initial step in the preliminary assessment was to identify a number of sites to investigate. This selection was based on four principal criteria: road access, transmission distance, exposure to wind and geotechnical information. This information was obtained from topographic maps and aerial photographs of the St. Anthony area.

Based on this information and the location of communication towers, 10 potential sites were selected to be further investigated. All of these sites have an elevation above the surrounding area, were near roads and transmission lines, and are barren and uninhabited. A field investigation was then undertaken to visit the sites and verify them.

All 10 of the initial sites were visited. The location of roads and transmission lines were confirmed en route to each the sites.

Site No. 1

Site 1 is located on a ridge southeast of the town of Goose Cove, on the Goose Cove Peninsula. The ridge is largely a barren outcrop of rock. Access to the ridge is difficult; however, several moderate slopes are present. These would allow for access road construction. The highest portion of the ridge is further southeast and access to this peak will be much more difficult.

Roads and transmission lines are found in the town but not on the ridge. Winds from the north to the northeast are blocked by a higher ridge known as the Three Mountain Summits. This site is large and uninhabited and a wind farm is possible.

Site No. 2

Site 2 is located 1.5 km northeast of Goose Cove on a ridge known as Three Mountain Summits. This is one of the highest mountains in the St. Anthony area. The mountain is very close to the main road and transmission lines but access to the summit is extremely difficult. If access were possible, the site would be excellent since it is high, uninhabited, large enough for a wind farm and the summit appears to be all rock.

Site No. 3

This site is situated on Cremaillere Hill just outside of St. Anthony. It is the remains of an old Pine Tree Line Radar Base. This is the highest of the hills immediately surrounding St. Anthony. It is accessible by road and there is a poleline within a few hundred feet of the summit. The area is cleared of all rock, with the exception of the concrete foundations. The area is not large and more than one wind turbine may not be possible.

The main drawback with this site is that three communication towers are visible with one being quite close. How a wind turbine will interfere with transmissions from these towers in uncertain.

Site No. 4

This site is located on a ridge beside the town of St. Carol's on the coast northeast of St. Anthony. It is a barren rock outcrop and access from the community appears reasonable. Transmission distance from the community is short and a wind farm is possible.

The problem with this site is that there is a larger ridge to the west which could partially block all winds from the southwest to the northwest.

Site No. 5

This site is located on a hill south of the community of White Cape Harbour. It is on the coast, northeast of St. Anthony. The hill is higher than the surrounding area and access is difficult. The summit is barren. Due to its small size, a wind farm would not be possible.

Figure 9

Ranking of the Initial Sites

RANKING	COMMUNITY	SITE NO.	SCORE
1	Cape Norman	10	155
2	Cook's Harbour	9	150
3	St. Anthony	3	145
4	L'Anse aux Meadows	7	130
5	Ship Cove	8	115
6	St. Carrol's	4	110
7	White Cape	5	110
8	Goose Cove #2	2	105
9	Cape Raven	6	105
10	Goose Cove #1	1	100

Maximum Possible Score = 160 points

Site No. 6

This site is located on a ridge known as Cape Raven, situated on the north coast of the Great Northern Peninsula. This ridge is barren with some shrubs and small trees. It is very close to the road and transmission lines. There appears to be sufficient area for more than one WECS.

The difficulty with this site is also access. There is one pass through the ridge in which a poleline crosses. Access to the ridge is much simpler here. A potential problem is that the town has set up a children's playground along this pass and access may disrupt its operation.

Site No. 7

Site 7 is located in L'Anse-aux-Meadows, on the coast north of St. Anthony. There are several ridges in the area with flat surroundings which would make suitable locations. The ridges are barren and most of them are rock. There is room for a wind farm.

There are two problems with this site. First, winds from the southeast would be blocked by Site No. 6 at Cape Raven. Second, L'Anse-aux-Meadows is a national historic site and Parks Canada have indicated that a wind turbine will not be aesthetically pleasing in the area. Strong opposition to any visible construction in the area can be expected.

Site No. 8

This site is also on the north coast of the Great Northern Peninsula. It is situated on Cape Onion, north of the community of Ship Cove. It is the highest ridge in the surrounding area, barren, uninhabited and there is plenty of room for a wind farm. However, a major problem with this site is that it is just over 1 km from the main road and estimated construction costs for an access road are higher than for any other site.

Site No. 9

This site is just northeast of Cook's Harbour on the north coast of the peninsula. It is on a gently sloping, rocky ridge and access for construction purposes will not be difficult. The elevation of the land increases from the road as you go farther towards the coast, ending in a cliff. The farther you go, the longer the access road and transmission distance will be. There is sufficient area available here for more than one WECS.

Site No. 10

This site is the most northerly of the 10 sites. It is just inland of Cape Norman. The site consists of a ridge with very low land surrounding it. The area is barren and the ridge is all rock. Access to the site is easy; a road would not have to be constructed. A transmission line passes alongside the ridge. Finally, the area is large and a wind farm is possible.

Final Assessment (**Figure 10**)

Since the 10 initial sites selected in this study are in very close proximity and are interconnected by both roads and an electric grid, only four items of the decision matrix were deciding factors in the final site selection. These items are topography, site access, connection distance and wind farm possibility. The sites all received the same point score for the other items in the matrix.

Topography is extremely hard to score if there are higher points of land within the 10 kilometre radius. The amount of wind sheltering and turbulence associated with large- and small-scale features is a rough estimation at best. Accurate predictions cannot be based solely on topographic maps and wind rises for the general area. Monitoring the wind at various elevations for each of these sites is the only accurate way to predict how topography will influence the winds.

The scoring of points for site access did not apply to this area and this item had to be rewritten. The ease of road construction was estimated and points were awarded on their relative difficulties. As with topography, an accurate estimation is not possible without a thorough investigation.

Connection distance appears to be straightforward as outlined in the assessment methodology. Scoring was done on this basis although the type of transmission line at the connection point, three-phase or single-phase, was not considered. It is more desirable to connect the WECS to a three-phase line than a single-phase line. This was not considered in the assessment methodology.

The fourteenth item, wind farm possibility, was considered for each site. However, the importance of this item is indicated by its low weighting since the plan of having a wind farm is only a possibility.

Of the 10 initial sites, (**Figure 11**), four show a much higher potential for wind energy conversion than the others. These four are Cape Norman (155), Cook's Harbour (150), Cremaillere Hill, St. Anthony (145), and L'Anse-aux-Meadows (130).

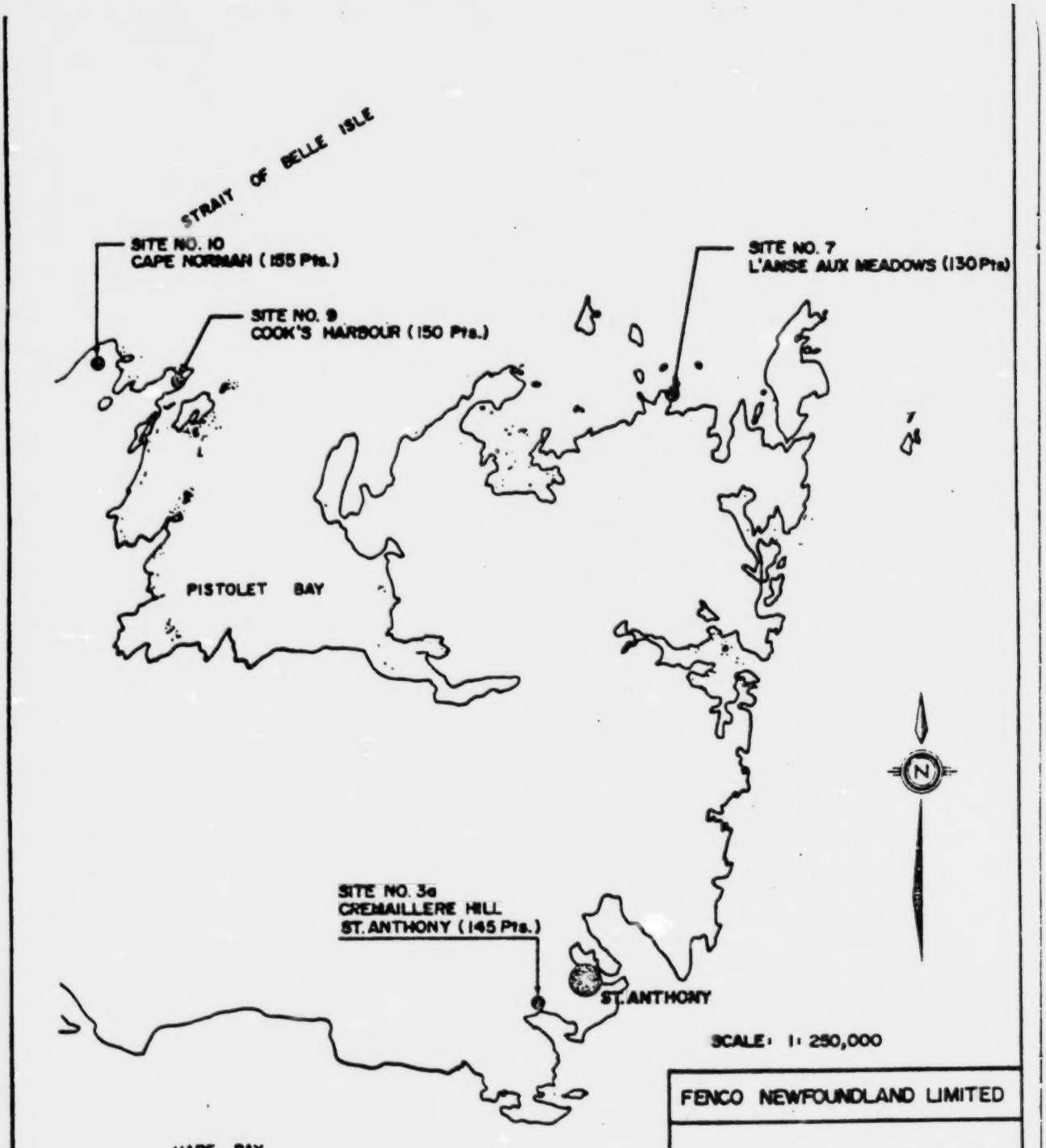
Figure 10

An Assessment Methodology for the preliminary selection
of Wind Energy Conversion Systems in Remote Communities
in the Province of Newfoundland and Labrador

DECISION MATRIX

Weighing Categories		Wind Field	Topo-graphy	Safety	Icing	Soils & Geology	Skill & Equipment	Access	Social Impacts	Acquisition	Demo Visibility	EMI*	Connection Distance	Min. Demand	Wind Fare	Total
Max. weight		Yes/No	Yes/No/30	Yes/No	10	10	10	25	10	10	5	15	20	10	5	160
Community	Site No.															
Goose Cove #1	1	YES	0	YES	10	10	10	5	10	10	5	15	10	10	5	100
Goose Cove #2	2	YES	20	YES	10	10	10	0	10	10	5	15	0	10	5	105
St. Anthony	3a	YES	20	YES	10	10	10	25	10	10	5	15	20	10	0	145
St. Carrol's	4	YES	20	YES	10	10	10	0	10	10	5	15	5	10	5	110
White Cape	5	YES	20	YES	10	10	10	5	10	10	5	15	5	10	0	110
Cape Raven	6	YES	20	YES	10	10	10	0	10	10	5	15	0	10	5	105
Lanse aux Meadows	7	YES	20	YES	10	10	10	20	5	5	5	15	15	10	5	130
Ship Cove	8	YES	30	YES	10	10	10	0	10	10	5	15	0	10	5	115
Cook's Harbour	9	YES	30	YES	10	10	10	20	10	10	5	15	15	10	5	150
Cape Norman	10	YES	30	YES	10	10	10	20	10	10	5	15	20	10	5	155

* EMI - Electromagnetic Interference


STRAIT OF BELLE ISLE
SITE NO. 10
CAPE NORMAN (155 Pts.)
SITE NO. 9
COOK'S HARBOUR (150 Pts.)
SITE NO. 7
L'ANSE AUX MEADOWS (130 Pts)
PISTOLET BAY
N
SITE NO. 3a
CREMAILLERE HILL
ST. ANTHONY (145 Pts.)
ST. ANTHONY
SCALE: 1: 250,000
HARE BAY
FENCO NEWFOUNDLAND LIMITED
FINAL SITE SELECTION
FIGURE 11

The L'Anse-aux-Meadows site ranked fourth in the evaluation matrix. There are two weaknesses in the location of this site. First, the site is further away from three-phase transmission lines than the top three sites. Upgrading the single-phase transmission line to three phase will increase the overall installation cost of the WECS compared to the other three. Second, during the assessment of this site, Parks Canada indicated that they have spent large sums of money on the National Historic Site and they would strongly oppose any major construction in the immediate area.

The top three sites are promising in all areas of the evaluation. Cremaillere Hill in St. Anthony scored slightly less than the other two because it is uncertain if the White Hills to the northwest will shelter winds or create turbulence. These hills are at a much higher elevation and winds blow for the northwest a high percentage of the time. If the hills do not adversely influence the wind, this may prove to be the best location. A road to the site already exists and the connection distance is very short. An added advantage is that the concrete foundations from the old American radar base may be used for future wind site development.

Wind sheltering and turbulence is not a problem for Cape Norman and Cook's Harbour. They are very near to each other and the land in the area is flat and barren. There are no obstructions to the wind within 10 kilometres. Road work to each site is not difficult or costly. Cape Norman scored the same points as Cook's Harbour in all categories but connection distance. The connection distance to the Cook's Harbour site is slightly greater than the Cape Norman site, thus the five point difference.

Cook's Harbour may prove to be a better site due to three phase electrical connection, even though it was the connection distance item that made it second to Cape Norman. Cook's Harbour is nearer the three-phase transmission line than Cape Norman, but farther from the nearest line, which is single-phase. The cost of upgrading the single phase line from Cape Norman will have to be weighed against the extra cost of erecting a longer transmission line from the proposed site in Cook's Harbour.

So, Cook's Harbour and Cape Norman basically were pretty much equal in evaluation, with St. Anthony a close third.

Question and Answer Period - Wind Studies

Question

Patrick Cabot, West St. Modeste

Concerning the Labrador Coast study, how were the communities you studied selected?

Answer

Dave Hood, ShawMont Newfoundland Ltd.

We selected the communities that qualified under the terms of the RCDP, that had grid isolated systems. There were no site visits made.

Comment

Wilfred Cutler, Ramea

I'd like to take issue with the scoring for Ramea--Ramea vs. Burgeo. We're told by the Department of Transportation that Ramea is connected by road since there's a car ferry going between Ramea and Burgeo. I think Ramea should be scored higher under the isolation category. I think that Burgeo will be connected to the grid within five to ten years. I can't see Ramea ever being connected to the grid. Also, our oil comes in by ferry which tends to overburden the ferry. Reducing the amount of oil we use would have the added benefit of relieving the burden on the transportation requirements. I think a lot more interest should be shown to Ramea.

Comment

Nat French, Conference Chairman

As I understand it there's a great deal of consideration for putting Burgeo on the provincial grid. That might come about as a result of the studies being done at Cinq Cerf, the gold prospect. If those studies are positive and it looks like a mine will be developed, there would probably be an interconnection with Burgeo. In that case the information in the wind study would apply equally to Ramea. Ramea would become the number one site by default.

Question

John Evans, Newfoundland Light and Power

Assuming an infinite capacity for a given system--diesel or whatever--for the size of the wind turbine that you would be installing, what kind of load factor do you anticipate that the wind turbine would provide on an annual basis? With respect to economics, what sort of escalation rate did you use for fuel?

Answer

Dave Hood, ShawMont Newfoundland Ltd.

The escalation rates we used were given to us by Newfoundland and Labrador Hydro. I'm not to sure what it is you're looking for in your question about load factor.

Question

John Evans, Newfoundland Light and Power

What percentage of the time during the year do you feel that the winds are the right speed so that your turbine can operate at nominal output?

Answer

Dave Hood, ShawMont Newfoundland Ltd.

That is something we can only determine by monitoring the site; finding out what the wind regime is at the site. Based on the available Atmospheric Environment Service (AES) information at Burgeo, we considered that the wind would blow when we most needed it, i.e., in the winter when the minimum demand would be higher. We felt that we'd be able to utilize the full output from a Wind Energy Conversion System (WECS) machine throughout the year.

Answer

Douglas White, Fenco Newfoundland Ltd.

In the St. Anthony study, we didn't look at that in terms of the physical capability of the system. We only considered the potential. We didn't consider any of the physical characteristics of the system that would be put in place.

Question

George Sturge, Newfoundland and Labrador Hydro

It's Hydro's experience that the amount of ice buildup on the Northern Peninsula, is probably greater there than anywhere else, especially on the highlands. Did you do any work on the amount of ice buildup you might expect on the WECS?

Answer

Douglas White, Fenco Newfoundland Ltd.

I'm not sure whether that was looked into in terms of accumulation per hour or the maximum amount of buildup in a specific storm. We looked at Hydro's log books but for the general assessment we used the AES data. If you wanted to study the potential buildup for a vertical axis wind turbine, you would have to look at severe storm cases and perhaps do some hindcast of what the 50-year ice storm might produce.

Comment

George Sturge, Newfoundland and Labrador Hydro

Hydro has some measured field data on ice buildup on the Northern Peninsula.

With respect to mini-hydro and wind, it appears that the desirability of these alternative energy systems depends on the size of the grid you're feeding them into, and whether that grid can absorb the systems' minimum and maximum energy output. It seems that the larger grids are the better to work with because they can absorb the amount of output, both kilowatts and energy.

Comment

Nat French, Conference Chairman

That's true. That's one of the consistencies we've found.

Question

Elliot Rodger, EMR

You've both applied the technology developed here. I wonder what the applicability of the methodology is to other areas of Canada?

Answer

Dave Hood, ShawMont Newfoundland Ltd.

The methodology we devised could be adapted to anywhere in North America. It would have to be tailored to each site though.

Answer

Douglas White, Fenco Newfoundland Ltd.

The decision matrix given to us by EMR had to be adjusted in some cases because we were looking at a number of sites within in a common area. We weren't looking at sites that were remote from one another, with significantly different characteristics. The matrix is flexible enough to allow for that. You may need to adjust the weight you give to certain categories depending on the area being examined.

Question

Duncan Hume, Howden Group Canada Ltd.

In the South Coast study, I understood you were matching existing diesel capacity to existing load demand. You didn't want that match to reflect a situation where the diesel generators would have to operate below 40% of capacity. You turned down six communities based on that criteria. The thing is, load demand in those communities is based on penalties for using electricity for say, space heating. In the absence of those penalties, the load demand could be greater thereby allowing their inclusion. Am I right in my understanding of that?

Answer

Dave Hood, ShawMont Newfoundland Ltd.

Yes. One of the solutions to the penetration problem was to create more load. If you can create more load by having a dump load for instance, you can create an artificial load to satisfy the operating requirements of the diesels--to keep them from running below 40%. But I think that would be counterproductive in that you're creating loads where you're really trying to save electricity. We thought more in terms of controlling the output from the WECS. There are various methods of doing that. A pitch control for instance, can control the output from the machine at various wind speeds. There are a number of manufacturers who do limit the maximum output from their machines by using a pitch control. This pitch control could be used to limit output from the machine during periods when the minimum demand is low.

We're talking about the long-term operation of a diesel down to 40%. There's no reason why it can't swing down below 40% for short periods of time. In fact, a diesel can operate for short periods of time and the governor will still be able to control down to less than 20%.

Introduction - Biomass Studies

Nat French, Conference Chairman

Don't let the technical nature of these reports put you off. I'm a little surprised that the people here from development associations, town councils, and from some of the communities are not asking more questions of the resource people. It may be that you're somewhat intimidated by the technical jargon. I know that I am. Don't let that stand in your way. If you feel you have a question, don't hesitate to get it out. The resource people will be only too happy to answer it for you.

This afternoon we're going to be looking at the biomass studies that were done under RCDP. The studies include the one at Roddickton, where burning biomass would be utilized to generate electricity. That one was done by ACRES International. The coastal Labrador study, done by Highlands Contracting, and the Cartwright/Black Tickle study which was done by Terpstra Engineering Ltd. Our three resource people for this block are Maurice Mills, from ACRES, Warren Strong, from Highlands Contracting, and Jelle Terpstra.

An interesting thing about this particular block is that the consultants are from St. John's, Gander, and Goose Bay respectively, so we're going to get some interesting perspectives.

We'll start off with Maurice Mills and what went on in the Roddickton study.

Roddickton Study

Presenter: Maurice Mills,
ACRES International Ltd.

The Roddickton study was commissioned by the White Bay Central Development Association in 1984, with financial contributions from EMR, the provincial Department of Mines and Energy, and the provincial Department of Forest Resources and Lands.

The study's objectives were:

1. to assess the feasibility of utilizing biomass in the area as a source of fuel to provide electricity to replace the present diesel generating units

2. to assess the biomass resources in the area

3. to assess the socio-economic impact of any development in the area

The study had several distinct phases. These were:

1. to review the power requirements of each generating section and eliminate sectors which were not economical

2. to review the various means of utilizing the available biomass for electrical production and select the most practical system

3. to identify the available biomass resources in the area

4. to estimate the socio-economic impact of any development in the area

The area under study can be split into these sectors each with its own generating unit: (**Figure 1**)

- Main Brook which has a present peak load of 336 kw with a projected peak of 433 kw in 1988

- Croque which has a present peak load of 81 kw with a a projected peak of 121 kw in 1988

- Roddickton which supplies electrical power for the settlements of Englee, Bide Arm and Roddickton, and which has a present peak load of 2026 kw with a projected peak of 3000 kw in 1988

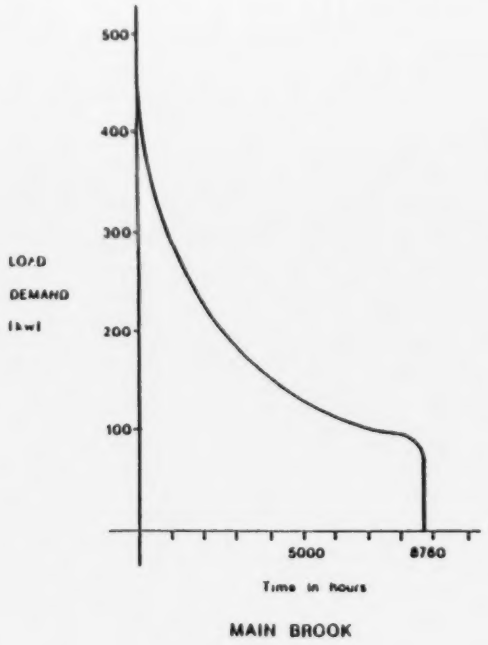
Load duration curves were prepared for Main Brook and Croque as shown in **Figure 2.** It can be seen that in the case of Main Brook and Croque, that a unit to operate in an economic manner would be in the order of 200 kw for Main Brook and 50 kw for Croque. The capital cost of installation was calculated and a payback period of well in excess of 20 years was estimated. It was then decided that these two areas did not warrant further investigation.

POWER REQUIREMENTS

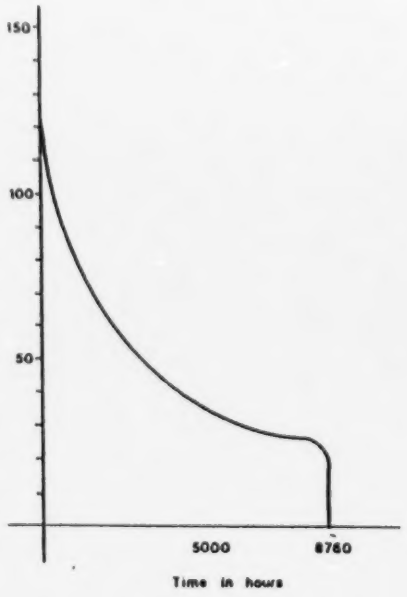
Location	Present Peak Loads	Projected Peak 1988
Main Brook	336 kW	433 kW
Croque	80 kW	120 kW
Roddickton Englee Bide Arm	2026 kW	3000 kW

	1988 Base Load
Main Brook Croque St. Julians St. Anthony	2155 kW

Fig. 1



MAIN BROOK



CROQUE

MAIN BROOK & CROQUE ESTIMATED 1988 LOAD DURATION CURVES

BIOMASS UTILIZATION STUDY
WHITE BAY CENTRAL DEVELOPMENT ASSOCIATION

The load duration curve for Roddickton is shown in **Figure 3.** It includes the input from the mini-hydro unit which is in operation. We can see from the curve that a unit, to carry the complete base load and operate with maximum efficiency, would be in the order of 1000 to 5000 kw. Preliminary estimates indicated a possible satisfactory payback so the system was then subject to a detailed study.

Further work has been carried out to look at providing a large plant at Main Brook which could be capable of providing a base load for St. Anthony and the Main Brook area. This would include Main Brook, St. Julians and Croque, which are being interconnected.

It was found that if it were possible to extend a transmission line from Main Brook to the new St. Anthony airport, power could be provided to the St. Anthony area from Main Brook. If this were possible, a 2500 kw unit could operate at Main Brook with all the resulting benefits. This concept will require a much more detailed study both in unit size and the impact on Newfoundland and Labrador Hydro's system.

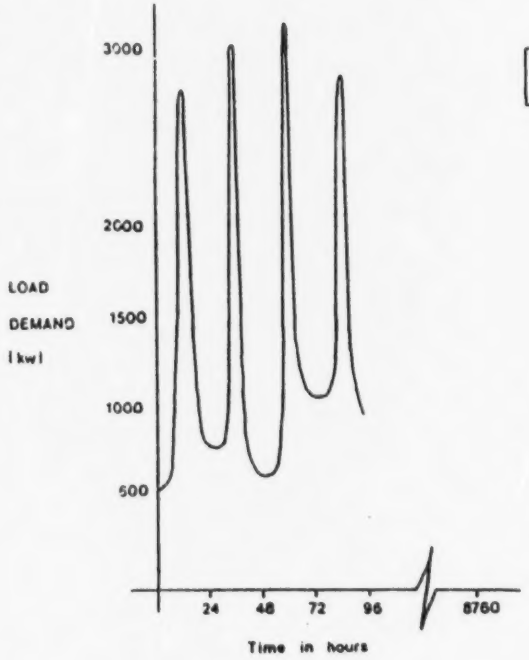
With an approximate unit size available, a study was conducted into the various options for producing electricity from biomass. The main options were:

- **Gasification:** in which wood fuel is gasified then used to run a diesel generating set. After an extensive literature and telephone review, it was concluded that for this size unit operating in a remote area on green wood of varying quality, reliability and maintenance problems would be very high. As reliability of equipment is a major factor in a remote area, this method was not considered further

- **Steam Generation:** in which wood or peat is burned to provide steam which in turn is used to run either a steam turbine or steam engine

A number of factors were considered, the main being ease of operation and maintenance problems. From discussions with turbine boiler manufacturers, it was found that the most cost effective and maintenance free system would be a low pressure fire tube boiler operating at a pressure of 250 psig (1722) kPa, supplying steam to a single or multi-stage turbo-generator.

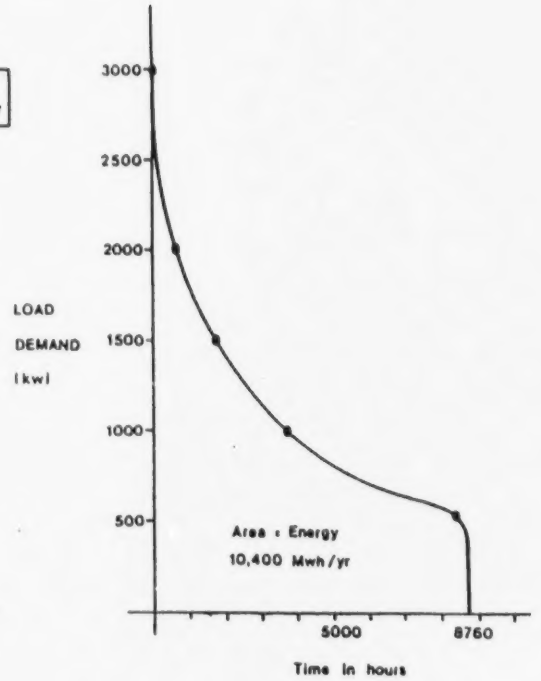
Further investigation of the initial study found that steam engine generating sets which can produce the required output are available from two suppliers. The steam engine has a very high reliability factor and a very low maintenance cost. Before a final selection of unit size is made, a more in-depth study would have to be carried out on the turbine vs. steam engine issue.



(a) Continuous demand record (assuming peak demand at noon each day).

Capacity	Number of hours per year
600	8760
1000	6000
1500	2000
2000	800
3000	100

(b) Tabulation of demand from continuous record for year.



(c) Annual load-duration curve.

LOAD DURATION CURVES SCHEMATIC

BIOMASS UTILIZATION STUDY
WHITE BAY CENTRAL DEVELOPMENT ASSOCIATION

ACRES

The available fuel in the area is limited to woodchip/sawmill waste and peat. It was found that although there is a large amount of peat in the area, the present production systems on the island and drying time available put severe restrictions on the amount that could be supplied for use on a guaranteed basis. It was also found that the production cost for private production was unknown, but indications were that it would not be competitive with wood fuel. It was decided that the best source of fuel available would be woodchips and sawmill waste.

The chipping operation would operate in conjunction with the Department of Forest Resources and Lands to ensure that over-mature trees, and high, graded areas were cleaned up and reforested.

Using past data on wood costs and an estimate of blended sawmill waste and whole-tree chips, a cost of $31/T was selected for this project. Based on estimated wood fuel cost, known site conditions and budget information from equipment suppliers, a unit of 1250 kw was selected as being the optimum size. This unit would consume approximately 17,000 T of green wood per year, increasing to 23,000 T in 1988. A forest resource study was carried out by Northland Associates Limited which identified an adequate supply for the next 20 years.

The socio-economic review of operations was performed by Omnifacts of St. John's. The installation of a woodchip burning boiler is expected to have a very positive socio-economic impact on Roddickton. A large portion of the wood cost--over $500,000 in the first year--would remain in the area as wages.

As the supply of wood fuel would provide a market for small-size wood encountered with a sawmill operation, this would enable Canada Bay Lumber to be reactivated, creating approximately 45 jobs in the mill operation with additional jobs for the fuel chipping aspect. It is estimated that a total of approximately 100 positions would be created if the wood burner plus the sawmill were in operation, (**Figure 4**).

The total capital cost, including all equipment, civil works and engineering, was $2 million in 1983 dollars with a payback of 16 years.

Nat French, Conference Chairman

Just an update on that project: we heard Mr. Collett tell us yesterday that Newfoundland and Labrador Hydro will be doing further feasibility work this year--fiscal 1986--on the Roddickton project.

SOCIO - ECONOMIC

OMNIFACTS RESEARCH LIMITED

- Chronic Unemployment in Area & Seasonal Work Dependent on Fishery

WITH NEW SYSTEM

- Construction 320 - 400 Man Weeks Work With $160, - $180,000 Direct Wages

- Operation of Plant

Plant Operation & Fuel Supply	20 jobs
Canada Bay Lumber Operation	100 jobs
Possible Total	120 jobs

Fig.4

Introduction

Nat French, Conference Chairman

Our next speaker is Warren Strong from Gander. He has an engineering degree from University of New Brunswick, and is president of Highlands Contracting Ltd. He's involved in consulting, forestry engineering, and also has an interest in log home manufacturing.

The study in which he was involved was the Coastal Labrador biomass study. Mr. Strong will give us a brief summation of his findings.

Coastal Labrador Study

Presenter: Warren Strong
Highlands Contracting Ltd.

This study involves the review of the potential to convert commercial buildings to wood burning in three areas of Coastal Labrador and Newfoundland as follows:

Region 1 - Labrador Coast

Region 2 - Labrador Straits

Region 3 - Roddickton/Main Brook

A visit was made to each area to investigate the conversion potential of the buildings there and to ascertain the available wood resources. A number of criteria were applied and weighed by importance. Each building was scored and the region totals determined the best region. Region 1 was chosen as having the most potential. The main factors were cheaper wood and higher fuel prices.

Wood conversion was studied from the point of view of using wood chips and round wood. It was determined that the economy of scale was not large enough to justify wood chipping and a heat storage solid-wood burning unit was recommended.

After research by Acres International Ltd., it was decided to recommend the Tempest wood burning system. This system uses a fluid heat storage system providing up to 12 hours of heat without firing of the furnace.

The wood analysis summary in each region is as follows:

Region	Volume/Cds.	Condition	Accessibility
1	2,000,000	Burnt Dry	Good
2	74,000	Overmature	Poor
3	49,000 AAC	Overmature	Good

Note: AAC is Annual Allowable Yearly Cut

An economic analysis of the payback periods revealed that paybacks of five to 11 years are available.

After reviewing all the criteria it was recommended that three buildings in the community of Port Hope Simpson be converted to wood burning. These are:

1. The Pentecostal School
2. The Bayview Integrated
3. The Grenfell Hospital

This study also looked at the potential to ship firewood from Port Hope Simpson to communities on the coast of Labrador. The majority of the wood in the Port Hope Simpson area is burnt, dry, black spruce and is excellent firewood. It was recommended that a shipping trial be carried out in 1985.

Nat French, Conference Chairman

I think you can gather from Warren's presentation that he's more forester than he is engineer. He's a true enthusiast and there's absolutely nothing wrong with that.

Introduction

Nat French, Conference Chairman

Our next speaker is Jelle Terpstra. He was born in Holland, has a masters degree in Civil Engineering, and is the owner of Terpstra Engineering in Goose Bay. He's been involved in consulting engineering, mostly municipal engineering projects such as water and sewage systems and buildings. I also know he has a fairly extensive background on energy type projects. Mr. Terpstra is going to be talking about the Cartwright/Black Tickle study.

Cartwright/Black Tickle Study

Presenter: Jelle Terpstra,
Terpstra Engineering Limited

For those of you who are unfamiliar with the location of Cartwright and Black Tickle, they are both located on the Labrador coast approximately 230 km and 310 km east of Goose Bay by air. Neither of them has road access to other communities and Black Tickle is located on an island off the coast. Both of them are definitely remote communities. They are located on the part of the Labrador coast immediately north of the area covered in the Coastal Labrador study. Our remarks and our findings are, therefore, similar in some aspects although we looked at more residential buildings.

The population of Cartwright is 580, and of Black Tickle, approximately 220. Although both communities are occupied year-round, they are largely dependent on the fishery and as a result many fishermen move out in the summer to their fishing stations.

For many years the fishery has been poor and as a result, incomes low. This, coupled with increasing oil prices, made people more and more dependent on biomass fuel. In both communities wood is the only biomass fuel used.

The purpose of the study was to assess the potential to increase the use of biomass fuel and reduce consumption of imported oil.

We took the following approach:

1. First we investigated the existing situation in both communities by means of a door-to-door survey that covered 100% of the occupied buildings.

   All necessary information was recorded on a questionnaire form by our researchers. Additional interviews were held with representatives of schools, hospitals, powerplants and businesses.

2. As a second step forecasts were made for future developments, assuming that no major infrastructural changes are made.

3. Finally, infrastructural and organizational changes were recommended and their impact on the use of wood investigated.

Throughout the study we looked separately at the following sectors:

- residential energy demand
- combined commercial and institutional demand
- power plant demand

Residential Heating Fuel Demand

In Cartwright and Black Tickle, wood already forms the largest category among domestic heating fuels. In Cartwright, 85% of the homes use wood either exclusively or in combination with oil or electricity, in Black Tickle that figure is 61%. In Cartwright 70% of the people who currently burn wood always burned wood. In Black Tickle 60% switched over in 1981 and 1982.

Those people in Cartwright who still burn oil do so because they have no physically able, unemployed person in the home who can get firewood, or because they live in federally owned housing units and are not responsible for their heating costs. The last category has no incentive to conserve oil or to convert to biomass fuel.

In Black Tickle those people who still burn oil do so because they have no physically able, unemployed person in the home who can get firewood or because their wood supply is so far away (42 km average haul).

So, without major infrastructure changes, the saturation level has been reached in both communities and very few additional homeowners will convert from oil to wood. Actually, the reverse may be true as distances to wood supplies continue to increase and oil prices stabilize or drop, or when the local economy improves as a result of improvements in the fishery. When some or all of these things happen, some people will convert back to oil or to electricity.

Fuel demands could also drop when homes are retrofitted or use more energy efficient stoves. Present insulation values are far below recommended standards and a major effort should be made to educate people about the benefits of retrofitting.

It was staggering to see how many homes had inadequate insulation levels, compared to currently recommended levels. In Cartwright the average insulation thickness of basement or crawlspace walls was only 18 mm (three-quarters of an inch). In the main floor walls it was considerably better with the traditional 82 mm (three-and-a-quarter inches) average. But in the attics the average was only 80 mm (three inches)!

	Existing (Cartwright)	Recommended (Cartwright/ Black Tickle)
For wall assemblies	2.3	3.7
Foundation/basement walls	0.8	2.1
Roof or ceiling assemblies	2.0	7.1

In Black Tickle the situation is not much different. There is much room for improvement of these insulating values, and it is hoped the development association will be able to get this message across to the people. Otherwise, a demonstration project will certainly have results.

Visual observations further indicated considerable heat loss through air leakage around doors and windows due to inadequate vapor barriers.

Finally, fuel demands could drop as a result of a shrinking population as in Cartwright, where the population dropped from 752 in 1971 to 580 in 1985. In Black Tickle, after a period of stagnation from 1976 to 1981, the community has slowly grown again to a population of 220.

The results of our door-to-door survey were very interesting. The annual cost to heat a typical home in Cartwright and Black Tickle exclusively with oil, wood or electricity is:

	Cartwright	Black Tickle
Oil	$1,950	$4,280
Wood (including labour costs)	$1,845	$5,775
Wood (excluding labour costs)	$ 685	$3,050
Electricity	$2,510	$4,325

It can be concluded that at the present hauling distance of 10 km for Cartwright, wood heating is still more economical than heating with oil or electricity, even when the cost of labour at $4 per hour is taken into account. Excluding the cost of labour, they can save an average of $1,270 per year on their annual heating bill by burning wood instead of oil.

In Black Tickle, because of the long haul, when the cost of labour at $4 per hour is taken into account, wood heating is the most expensive form of heating. When no value is placed on the labour component for getting firewood, wood is approximately $1,230 per year cheaper than oil. Obviously, in Black Tickle people get a very poor return for their effort. They may have no other choice due to poor financial circumstances.

I want to elaborate a bit on why we selected $4 per hour as the cost of labour for acquiring firewood, as this figure is rather arbitrary.

One way to look at it is that many breadwinners get their Unemployment Insurance benefits during the winter months, or have physically fit sons or daughters who are not working and who would traditionally go into the woods anyway--for fitness, as a hobby or for fun. With this philosophy, the hourly rate would be nil.

On the other hand, cutting firewood in deep snow is no pleasure. It's extremely hard, uncomfortable and even hazardous work. It would normally cost $8 - $10 per hour to get people to do it as an occupation, unless they were desperately in need of employment, i.e., didn't have enough stamps to qualify for unemployment insurance.

We have taken $4 per hour as a happy medium knowing that productivity is generally pretty low as people have lots of time and generally not much much else to do. Interestingly, we found in our questionnaire--when we divided the total time spent to get firewood and saw it up, by the total number of sticks burned per year--that average productivity was only three sticks per person per hour.

The typical cost for people in Cartwright and Black Tickle to get firewood and look after their wood heating systems was found to be surprisingly high, when all related costs were taken into account. They were much higher than many people realized. For example:

	Cartwright	Black Tickle
Direct cost (gas and oil)	$36.54/cord	$86.83/cord
Indirect cost (repairs, maintenance of snowmobile, komatik, saw, clothing)	$41.10/cord	$110.37/cord
Labour cost (@ $4 per hour)	$132.00/cord	$176.00/cord
Total cost	$209.64/cord	$373.20/cord
Approximately	$210.00/cord	$373.00/cord

For comparison we found that wood could be shipped from Goose Bay to Cartwright or to Black Tickle on the dock for only about $72 per cord. So, from a strictly economic viewpoint, it would be better for people from both communities to import their wood from Goose Bay than to cut it themselves and haul it in komatik loads.

Another very interesting fact came out of the analysis of the questionnaire. We asked all homeowners what they would be prepared to pay for a cord of wood (100 sticks of wood). The average price quoted in Cartwright was $88.92 with a going rate of $75 to $100. That is only slightly higher than the above calculated direct cost of getting their own wood, excluding the cost of labour, which in Cartwright was $77.64. Obviously the people who cut firewood for others don't do it to make money but to be helpful.

In Black Tickle, people were only prepared to pay on the average of $60 per cord--far below the true cost.

Commercial and Institutional Heating Demands

The commercial and institutional buildings in Cartwright and Black Tickle use mainly oil as heating fuel (83% of their combined net energy demand). Most premises in those categories are either not occupied 24 hours a day, or their occupants are employed full time and have no time to look after a wood heating system. Without major government subsidies or incentives, it will not be feasible for each of them to convert to wood on an individual basis.

Power Plant Fuel Demand

The largest consumers of petroleum-based fuel in Cartwright and Black Tickle are the power plants, consuming respectively 67% and 63% of all oil burned in the communities (actual quantities are 630,430 litres in Cartwright, and 339,790 litres in Black Tickle).

As we heard earlier in this conference, ACRES Consulting Services Limited recently carried out a study to convert diesel power plants in Roddickton, Main Brook and Croque to biomass fuel. They found that only with the largest of the three--in Roddickton--would conversion be feasible. Because the Cartwright electrical demand is less than one-quarter of the Roddickton diesel generated energy and the Black Tickle demand even less than that, it was considered unfeasible for the Cartwright and Black Tickle power plants to convert to wood without significant government subsidies or incentives.

Impact of Government Incentives

Although the prospects for increased future use of fuel wood in Cartwright and Black Tickle are not good, there are ways to promote the conversion from oil to wood. All of these avenues require government incentives--at least in the beginning. Conversions could conceivably support themselves afterwards.

Most of these incentives are not economically feasible from an "off-oil" conversion perspective only. But because they could create considerable local employment and could have social benefits, they may be attractive to government from a combined socio-economic and employment viewpoint.

Methods to Increase Residential Fuel Wood Demand

Residential fuel wood demand can be increased in Cartwright and Black Tickle by lower cost and better availability. This can be accomplished by a new infrastructure and by organization.

The infrastructure could be an access road for the Cartwright area and secure wood storage depots in both communities, which would facilitate the harvesting of wood in bulk during the fall. The depots would also be required if wood is imported from Goose Bay by coastal boat during the summer.

Organizational requirements would be to set up the depots and arrange for access road construction and to try to get the private sector to run the depots. In case of a lack of interest from the private sector, the development association should manage the depots for one year to prove the depots' viability. After that period they should again attempt to transfer management to the private sector by calling for bids.

Cost of a depot for 1150 cords in Cartwright is $35,000. In Black Tickle a 400-cord depot would cost $25,000. Cost of a 16-km access road towards Paradise River is estimated to be $800,000. Docks in Cartwright and Black Tickle are adequate to handle the unloading of fuel wood especially if it is shipped in smaller quantities, i.e., 100 cords each week on the regular coastal boats.

Methods to Increase Commercial and Institutional Fuel Wood Demand

The previously mentioned infrastructure and organization need to be in place before any increase in the commercial and institutional demand can be expected. These sectors, however, require something extra to convert from oil to wood. They require government grants. They will also require an energy supply agency that will look after their heating systems on a contractual, day-to-day basis.

This, of course, can only be feasible if a large enough number of buildings participate, and is therefore out of the question for Black Tickle. In Cartwright, where the annual heating costs of these two sectors is $75,000, there appears to be some potential. Ideally a private sector firm should run the energy supply agency, but if no businesses or individuals are interested the development association could run it for the first year to get it organized. After the first year it could be put up for bids, together with the fuel wood depots.

Methods to Increase Power Plant Fuel Wood Demand

The only way that Newfoundland and Labrador Hydro could feasibly convert its power plants in Cartwright, is if sufficient government incentives were provided under employment creation programs. Because there is no real wood supply in the Black Tickle area, it is highly unlikely that its power plant will be converted. Cartwright, because of its large size and the availability of wood, has the most potential.

Conclusions and Recommendations

From a strictly economic viewpoint it is cheaper to import wood from Goose Bay than to cut it locally in both Cartwright and Black Tickle. To encourage "off-oil" conversion alone, one should encourage the shipping of wood from Goose Bay to both communities by way of setting up wood depots close to the docks. This is recommended for Black Tickle. From a socio-economic perspective, it would be better for the community of Cartwright if its local wood supply is made accessible for trucks by means of construction of an access road. A new 16-km long access road in the general direction of Paradise River would open up enough wood resources to supply the fuel wood demand for Cartwright for the next 20 years.

Fuel wood depots will require management and organization which ideally should be provided by the private sector. The development association should arrange for that right from the start, or after one year's operation when all the bugs have been ironed out and the depots proved viable.

To enhance conversion from oil to wood by the commercial and institutional sectors, the development association should further arrange for an energy supply agency, again, if possible, managed by the private sector. It would tie into the management of the fuel wood depots. With the above described infrastructural and organizational changes, wood can replace approximately 270,000 litres of oil per year.

Finally, the conversion would really have a large impact on Cartwright if the power plant were to be converted as well (with the help of government incentives). Assuming that 75% of the Cartwright power plant's energy demand were supplied by wood, oil consumption in Cartwright would be reduced an additional 470,000 litres per year.

Since we concluded our study in the spring of this year (1985) one new development has taken place that affects the study's results: Cartwright was chosen as the military radar site in Labrador. This site is the White Hills area, about 20 miles inland from Cartwright. As a result of this development, the government has already started to build a new access road that will open up large quantities of wood to truck access.

The development association is hoping to start shipping wood to Black Tickle next summer when the navigation season reopens.

Question and Answer Period - Biomass Studies

Introduction

Nat French

I want to thank all three of our presenters this afternoon. I think their presentations were all exceptionally well done and informative. I hope their presentations are going to generate a lot of questions.

Question

Dave Stewart, Provincial Consultants

What is the smallest wood-fired electricity plant that would be economic? What are the economies of scale for such a system?

Answer

Maurice Mills, ACRES International Ltd.

After you get below one megawatt it's getting very marginal. The incremental cost between putting in a very large unit and a very small unit is not that great. So, if you're below a megawatt forget it.

Question

Terry Nippard, Department of Rural, Agricultural and Northern Development

Mr. Strong and Mr. Terpstra, why the difference of opinion as to the feasibility of converting to wood from oil? Mr. Strong, you said it was feasible in Port Hope Simpson yet approximately 120 miles north it's not feasible?

Answer

Jelle Terpstra, Terpstra Engineering Ltd.

In Black Tickle 61% of the people use wood. Obviously it's feasible in the minds of the people or they wouldn't be doing it. But the cost of the way they are acquiring their wood at the moment is not economic. It would be better to bring their wood in from outside than to try to continue harvesting in Black Tickle. They can get wood landed at the dock for $72 a cord. It's considerably more expensive for them to make a 42 km trek to acquire it themselves. I think there would be greater impetus for conversion if the wood were available at dockside.

Question

Terry Nippard, Department of Rural, Agricultural and Northern Development

Have you (Mr. Terpstra) assessed the stock of wood in Cartwright?

Answer

Jelle Terpstra, Terpstra Engineering Ltd.

Yes, we have. There's plenty of wood in Cartwright for a long time to come. The thing is, those stocks are continually moving farther and farther away from the town. The average haul in Cartwright is about six or seven miles. Some people in Cartwright make the trip to Paradise River to get firewood, which is 23 miles. One of the things I didn't mention in the study is the question of economic radius. We estimated that it's economic for people to go in 23 miles. Within that 23 mile radius from Cartwright there's probably enough wood for 100 years. But what's needed is an access road so that a lot of wood could be harvested in a short time. It's a matter of efficiency.

Question

Terry Nippard

Mr. Strong, I'd like some clarification on the transportation costs you stated for wood. You quoted $80 to $100 taken from the island and transported down to wherever the coastal boats call.

Answer

Warren Strong, Highlands Contracting ltd.

The wood in Port Hope Simpson, the wood that we just received was $50 a cord (cutting cost). That was pretty well on the boat. It was $34 (shipping cost) when we (Strong and CN Marine) talked. Then when they (CN) shipped it the pricer said $44 per cord, but I'm quite sure that he made a mistake because he had said $34. So that's $84 a cord shipped to any of the ports the coastal boat goes into along the coast of Labrador ($94 using the pricer's second quote). Not only that, some of the people indicated that in the winter they might even cut it cheaper. The big thing in Port Hope Simpson is that the wood is dry. Dry wood is worth a lot more than green wood. That's the cost right there. Does that answer your question?

Answer

Jelle Terpstra, Terpstra Engineering Ltd.

In my study, although Goose Bay was not officially part of the study, we found that the infrastructure is all in place in Goose Bay as were contacts for wood on the dock for $50 a cord. We were given a quote by CN that for $22 a cord they would ship wood to just about everywhere down the Labrador coast. It didn't matter if it was the first port or the sixth.

Question

Nat French, Conference Chairman

So we're talking about a range of between $70 and $90 per cord?

Answer

Warren Strong, Highlands Contracting Ltd.

Yes.

Question

Nat French, Conference Chairman

Warren, Hydro has looked at the Pinware River for hydro development for quite some time. They've been deterred by environmental considerations. Would there be an environmental moratorium associated with wood harvesting in that area?

Answer

Warren Strong, Highlands Contracting Ltd.

We didn't look at environmental considerations with respect to the Pinware River but I'm sure that the environmental agencies would have something to say. There are people now harvesting wood from that area as the road goes in (the road that goes to Red Bay). Mind you it's not officially sanctioned harvesting. It's just as well to cut it. Most of it is rotten and it's unlikely anything will ever grow there again.

Comment

Janet Skinner, Norman Bay, Labrador

At a conference in Goose Bay last spring, Ken Colbert of the Department of Forest Resources and Lands, said that they have figures indicating it's unrealistic to expect people in Newfoundland to cut wood for less than $70 per cord because of the social considerations Jelle Terpstra referred to. Once again, where did the figures for the cost of a cord of wood from Port Hope Simpson derive from? $50 per cord sounds awfully good.

Answer

Warren Strong, Highlands Contracting Ltd.

It's a free market and that's what people are willing to provide it for. Actually, $35 per cord is what the paper companies pay. That's what it is worth alongside the road in most areas in Newfoundland. Transportation costs vary anywhere from $10 to $25 per cord. I think the paper mills here on the island--that's a union contract type of thing--are getting wood for $80 to $90 a cord. That's a whole different ball game than the situation we're looking at in Port Hope Simpson. We checked with the operator in Port Hope Simpson and he said that he would supply wood for $50 per cord.

Question

Janet Skinner, Norman Bay, Labrador

I'm from the Port Hope Simpson area. I just wanted to make sure that something didn't go down on the record that wasn't completely verifiable. It was a question in the summer. It's been clarified has it?

Answer

Warren Strong, Highlands Contracting Ltd.

I think that Mr. Colbert would be thinking of union contract wood with all the attendant costs involved for a large-scale operation. For firewood in Newfoundland, on the island, you can buy it delivered to your door for $50 to $55.

Question

Janet Skinner, Norman Bay, Labrador

Mr. Terpstra, when you considered your costs for the study in Cartwright, were the costs of reforestation and taking care of the standing wood in the Paradise River area considered--compared to the cost of harvesting the dead wood and burned wood around Port Hope Simpson which should be taken so that reforestation can take place? Also, when you did your house-to-house survey did you include Paradise River?

Answer

Jelle Terpstra, Terpstra Engineering Ltd.

We didn't look at any cost of reforestation. With respect to your second question, the survey was exclusive to Cartwright and Black Tickle. Paradise River was not part of our terms of reference.

Question

Patrick Cabot, West St. Modeste

Mr. Strong, you mentioned that it didn't make sense for people to burn oil if they could get wood for $80 to $100 per cord. Could you give us some idea of how long a cord of wood would last in an average home?

Answer

Warren Strong, Highlands Contracting Ltd.

Most of the people surveyed in West St. Modeste, L'Anse au Loup, L'Anse-au-Clair, and Red Bay, figure they burn 20 to 22 pickup loads which works out to about 10 cords of wood per year. Looking at it from that point of view, if they paid $100 per cord they would be paying $1,000 per year for heating. Those people in the area who are burning oil figure they are burning $2,500 to $4,000 worth of oil a year with $3,000 about the mean.

Question

Nat French, Conference Chairman

Jelle, you mentioned the extremely low insulation levels that you found in Cartwright and Black Tickle. Is that because people don't assign a monetary value to the wood that they cut, and as a consequence, they're not cognizant of its real cost? Would they look upon putting in more insulation as a way of saving them labour?

Answer

Jelle Terpstra, Terpstra Engineering Ltd.

I think it's more a lack of awareness. A lot of people traditionally haul wood. They don't like doing it. It's time consuming and creates hardships but they are not really aware of the benefits of proper insulation. It's an educational problem. Also, if the fishery is poor, they might not have the money to go out and buy insulating products.

Question

Gordon Weir, Councillor, Little Bay Islands

If we people in remote communities convert wholesale to wood from oil, is there any guarantee that the government won't decide to levy a tax on wood, putting us right back in the same situation with oil?

Answer

Nat French, Conference Chairman

Mr. Weir, the only thing I can offer you is the old saw: there's nothing certain except death and taxes. As far as I know, neither the provincial or federal government has any intention of taxing fuel wood. For one thing, I think it would cost them more to collect the tax than they would earn in tax revenue.

Question

John Evans, Newfoundland Light and Power

I don't think wood can be considered a renewable resource unless you have a reforestation program. I haven't heard reforestation addressed at all. Has that issue been looked at? Also, is the burning of wood in homes the most economic use of our wood resources?

Answer

Nat French, Conference Chairman

I think that most of the consultants have been looking at wood that would not be of any other practical use.

Answer

Maurice Mills, ACRES International Ltd.

In our portion of the study reforestation was pretty well left with the Department of Forest Resources and Lands.

Answer

Warren Strong, Highlands Contracting Ltd.

There is some natural regeneration in the Labrador region. The problem in the Labrador area is you're looking at 100+ years for rotation. That can be improved on with a reforestation program but that's really the purview of the Department of Forest Resources and Lands.

Comment

Bill Clarke, Department of Forest Resources and Lands

Concerning reforestation in the Roddickton area, we have an abundance of natural regeneration. Looking at the cost of reforestation, there is a cost at the timber age of between 10 and 20 years of thinning stands--it runs about $500 to $600 per acre. That's one cost that would have to be assumed. Still, it would create a lot of employment.

Comment

Art Locke, Town Manager, Roddickton

Many of us here are representing town councils. There aren't many B.Sc.'s or Ph.D's among us and I think we're somewhat overwhelmed by the technical information that has been presented. The other thing I wanted to mention concerns the cost of people cutting their own wood. The costs cited in some of the studies may be false because cutting wood is often a recreation-related activity. Lastly, when calculating payback periods, I think the consultants should incorporate savings to the two levels of government in terms of unemployment insurance and welfare benefits saved.

Comment

Nat French

I'm sure the provincial government or even Newfoundland Hydro wouldn't mind counting those savings into their payback analyses as long as the federal government would promise to give them what was saved.

Question

Art Locke, Town Manager, Roddickton

Most of these projects are funded 90/10 aren't they?

Answer

Nat French, Conference Chairman

Not anymore. Gone are the good old days.

Question

Art Locke, Town Manager, Roddickton

Mr. Mills, when you're calculating the demand and supply of power in the Roddickton area, I noticed you included Bide Arm, Englee and Roddickton. Was there any reason why you didn't include Conche?

Answer

Maurice Mills, ACRES International Ltd.

Pure oversight.

Comment

Nat French, Conference Chairman

When we were designing this conference we were aware that there were going to be certain sections that technically would be over the heads of some people. But dealing with technical material is inevitable. However, tomorrow, in the workshops, that's where the informal, non-technical interaction will take place. I hope it will provide a forum in which there can be a more relaxed discussion of the material presented here today.

Comment

Terry Nippard, Department of Rural, Agricultural and Northern Development

Jelle brought up a good point about the poor housing conditions with respect to inadequate insulation and consequent energy loss. I would invite someone here to get something on the go to address that problem. The Residential Assistance Program (RAP) is completely useless in Labrador. There's one representative to cover Nain to L'Anse-au-Clair. Also, Jelle's estimation of wood costs in Black Tickle is valid and not by any means looked upon as a source of recreation.

Comment

Nat French, Conference Chairman

The fact that you even raised the RAP issue may cause something to happen. I'm not sure whose responsibility it even is--perhaps Municipal Affairs or Newfoundland and Labrador Housing. Probably NLHC's.

Introduction - Subsidiary Studies

Nat French, Conference Chairman

So far, we've been looking at alternative technologies. But EMR has also paid a fair amount of attention to energy conservation activities under RCDP as well. We also looked at the potentials for residential fuel wood substitution--that is, substitution for oil. The following studies fall within that realm.

Paul Bugden is here with us. He is an economist from Memorial University, Vice-president of IDP Consultants Ltd., and the type of work they are engaged in is management consulting. Paul has over eight years' experience in economic, financial analysis with particular experience in energy and oil and gas economic analysis.

Paul is going to give us an overview of the study they carried out, The Potential for Energy and Fuel Wood Substitution.

Potential for Energy Conservation and Fuel Wood Substitution

Presenter: Paul Bugden,
Vice-president,
IDP Consultants Ltd.

This presentation is based on a report we prepared for EMR entitled, The Potential for Energy Conservation and Fuel Wood Substitution in Remote Communities in Newfoundland and Labrador.

Three companies were involved in the preparation of this report. These included IDP Consultants Limited who acted as the prime contractor, and BFL Consultants Limited and Research Associates who were sub-contractors. The report was released in March 1985 and is based on research conducted throughout the fall of 1984 and winter of 1985.

In the summer of 1983 an overview study on the RCDP was prepared for EMR. The study provided socio-economic profiles and technical assessments of the likely alternatives to oil for space heating and electrical generation in remote communities. As a result of the study a number of information gaps were identified. Of particular significance was the inadequacy of the available data-base to evaluate the potential for residential energy conservation and fuelwood substitution in remote communities. Consequently, the study under discussion here today was undertaken to partially alleviate those data gaps.

The present study had two major independent but interrelated requirements. The first requirement was to estimate the potential for energy conservation in each of the four regions defined as part of the overview study: Labrador, Northern, Central and Southern. The second requirement was to consolidate the existing fuelwood inventory base for each eligible community and estimate the potential for fuelwood substitution. Because of these differing requirements, two independent methodologies were developed. **Figure 1** provides a brief overview of the approach and methodologies used.

The principal survey findings are shown in **Figure 2.**

Figure 3 shows the potential for energy conservation and the estimated energy and dollar savings associated with this potential. The information in Figure 3 can be summarized as follows:

- Conservation potential, i.e., the difference between existing building heat loss based on present energy conservation standards and the reduction in heat loss possible by upgrading to CMHC standards, is 72% for all regions.
  Regionally, this breaks down as: Labrador 72%, Northern 70%, Central 73% and Southern 71%.
  Major areas for improvement are the ground floor and the attic and this is consistent throughout all regions.

- The estimated annual energy savings per household associated with this conservation potential is 136 million BTUs.
  Regionally this breaks down as: Labrador 186, Northern 128, Central 131, and Southern 96.

- The estimated annual cost savings per household associated with this conservation potential is $889. Regionally this breaks down as: Labrador $1,073, Northern $858, Central $830, and Southern $839.

Figure 4 provides more detail on the potential for energy conservation. This table shows the potential for heat loss reduction in seven areas. If appropriate actions were taken to achieve all the heat loss reduction which is possible, the energy and dollar saving described above could be realized.
Alternatively, if selected improvements were made, for example in the areas of infiltration and the attic, approximately half, i.e., 48% of the potential for heat loss reduction could be achieved. Regardless, it is clear from these results that the potential for energy conservation is high.

EXHIBIT 1

APPROACH AND METHODOLOGY

A. ENERGY CONSERVATION

- Energy conservation potential was assessed on a regional basis - Labrador, Northern, Central, Southern.
- The required information was obtained by a representative random sample telephone survey of 400 households, 100 per region.
- Energy conservation potential is expressed as a percentage and savings are shown in energy and dollar terms.

B. FUELWOOD SUBSTITUTION

- Fuelwood substitution potential was assessed on a community basis.
- Information was obtained from available inventory maps for 37 communities and 11 load centres.
- Fuelwood substitution potential is expressed in percentage terms as the estimated sustainable annual increase over existing fuelwood consumption levels.

EXHIBIT 2

PRINCIPAL SURVEY FINDINGS

- **The majority of homes in remote communities are owner-occupied, single detached dwellings that are either bungalows or two-storeys built after 1950. More specifically, 92% of homes are owner-occupied, 93% are single detached bungalows or two-storeys, and 73% are post-1950 construction.**

- The majority of respondents in remote communites use wood as the principal heating fuel, i.e. 53%. Regionally this breaks down as follows: Labrador 64%; Northern 56%; Central 62%; and Southern 29%.

- 94% of respondents do not use any form of supplementary heating.

- 91% of the respondents who use wood as their main heating source cut their own wood, and 91% of these obtain it within 20 miles of their homes.

- The estimated average annual consumption of fuelwood for people using wood as the main heating source is 11.1 cords. Regionally this breaks down as follows: Labrador 16.2 cords; Northern 9.3 cords; Central 8.8 cords; and Southern 8.2 cords.

EXHIBIT 2 (Continued)

- **The estimated average annual consumption of oil for people using oil as the main heating source is 956 gallons. Regionally, this breaks down as follows: Labrador 1181 gallons; Northern 1026 gallons; Central 1036 gallons; and Southern 767 gallons.**

- **The socio-economic characteristics of respondents can be summarized as follows:**

GENDER:	55% male, 45% female
AGE:	59% between 25 and 44
OCCUPATION:	28% in primary, 38% in other, and 34% not in labour force
EMPLOYMENT STATUS:	48% of respondents in labour force unemployed an average 5.5 months in past 12 months
EDUCATION:	43% completed Grade 8 or less
INCOME:	Average total household income estimated to be $21,219.

EXHIBIT 3

ENERGY CONSERVATION POTENTIAL AND ESTIMATED ENERGY AND DOLLAR SAVINGS BY REGION

	Energy Conservation Potential %	Savings (Million BTU's)	Savings $
Labrador	72	186	1072
Northern	70	128	858
Central	73	131	830
Southern	71	96	839
Total	72	136	899

EXHIBIT 4

MEAN HEAT LOSS BY REGION (BTU's/hr)

Household Characteristics	Labrador			Northern			Central			Southern			All Regions		
	Existing	Upgraded	Potential Reduction	Existing	Upgraded	Potential Reduction	Existing	Upgraded	Potential Reduction	Existing	Upgraded	Potential Reduction	Existing	Upgraded	Potential Reduction
Basement Floor	483	483	-	430	430	-	152	152	-	244	244	-	327	327	-
Ground Floor	26,998	2,021	24,977	27,089	1,892	25,197	24,369	1,787	22,852	17,567	1,296	16,271	24,006	1,749	22,257
Basement Wall	1,864	989	875	1,822	828	994	674	294	380	1,297	519	778	1,415	658	757
Above-Grade Wall	12,009	5,363	6,646	13,116	5,086	8,030	10,571	4,239	6,332	9,874	3,243	6,631	11,393	4,482	6,911
Windows	4,122	2,378	1,744	4,028	2,639	1,389	3,823	2,196	1,627	2,679	1,645	1,034	3,663	2,215	1,448
Roof and Attic	26,966	1,883	25,083	25,660	1,783	23,877	19,547	1,486	18,061	17,488	1,158	16,330	22,415	1,578	20,837
Infiltration	17,342	7,867	9,475	17,014	7,854	9,160	12,816	5,848	6,968	9,150	4,519	4,631	14,081	6,522	7,559
Total	89,784	20,985	68,880	89,159	20,512	68,647	72,222	16,002	56,220	58,299	12,624	45,675	77,300	17,531	59,769
Conservation Potential		72%			70%			73%			71%			72%	

The potential for fuelwood substitution in remote communities could not be examined for all locations owing to the lack of fuelwood inventory information, and because the survey results available from this study are only valid at the regional level.

Given these limitation it was only possible to do an analysis for 11 load centres encompassing 37 communities. This represents approximately half of the communities eligible for the RCDP.

Figure 5 shows the potential for increased fuelwood usage in these locations. As is evident from the table, only one load centre, Fogo Island, appears to be seriously overtaxing the resource base available. While St. Anthony is also approaching the limits of increased usage of the resource base, the other nine load centres have more than adequate fuelwood to satisfy present fuelwood consumption patterns.

While it is not possible to draw direct comparisons between the information presented in Figure 5 and the survey results, several points are worth noting. Five of the 11 load centres for which inventory information was available are in Labrador, and the survey results showed that the Labrador region had the highest percentage of respondents who reported using wood as a principal heating fuel (64%). Of the six remaining load centres for which inventory information is available, three are located in the Northern region, and three are in the Central region. For those areas, 56% and 62% respectively of respondents reported using wood as their principal heating fuel. For the area where no inventory information is available, i.e., the Southern area as defined by the survey, only 29% of respondents reported using wood as their main heating fuel.

These points suggest that there is a strong association between areas which have been mapped, and therefore contain timber stands of some significance, and the results of the survey which show that people in regions where mapping has not been completed use wood extensively for their main heating requirements.

In terms of attempting to make a judgment about the overall potential for fuelwood substitution, the available information makes definitive statements impossible. All that can be said is that for those communities for which inventory information is available, the majority of load centres, except Fogo Island and perhaps St. Anthony, could sustain substantial increases in the use of the fuelwood resource base.

EXHIBIT 5

ESTIMATED ANNUAL SUSTAINABLE PERCENTAGE INCREASE IN FUELWOOD USAGE BY LOAD CENTRE

Load Centre	Estimated Sustainable Increase in Fuelwood Usage - % Change
Cartwright	759%
Mud Lake	9589%
Black Tickle	94%
Postville	943%
Port Hope Simpson	1925%
Harbour Deep	179%
Roddickton	77%
St. Anthony	3%
Fogo Island	-76%
Little Bay Islands	163%
St. Brendans	154%

Conclusions and Recommendations

With respect to regional housing characteristics, the results show that 92% of respondents own their place of residence. The majority of dwellings are single, detached properties, i.e., 93%. Bungalows constitute 67% of the housing types in the study and two-storeys contribute a further 26%. 73% of the housing stock was built after 1950. This information clearly implies that any initiatives undertaken by EMR in remote communities should be directed towards owner-occupied, single detached bungalows or two-storeys built after 1950.

A majority of respondents, again regardless of region, have total household income levels which are quite low. Some 56% of respondents reported a total household income of less than $16,000. Clearly, attempts to encourage people in remote communities to invest in energy conservation actions will have to take into consideration the limited incomes available in these areas.

The majority of respondents in remote communities reported using wood as the main heating source. This is especially true for Labrador, where 64% of respondents reported using wood as the main heating fuel. The Northern and Central regions were 56% and 62% respectively. The Southern region was the exception with only 29% of respondents using wood as their principal heating fuel. It is also important to note that a large percentage (93%) of respondents do not use any form of supplementary heating. These above statements, plus the fact the 91% of respondents who reported using wood as their principal heating source cut their own supply and do so within 20 miles of their homes, suggest that wood is being extensively exploited and relied upon heavily. These conclusions have important implications for the potential for energy conservation and for fuelwood substitution, especially in the Labrador, Northern and Central regions. Specifically, because a majority of respondents in these areas are burning wood and cutting it themselves within close proximity to their homes, and therefore are paying very little for their energy requirements, it may be difficult to convince individuals in these areas to invest in energy conservation initiatives. With respect to fuelwood substitution potential, the above conclusions also suggest a saturation point may have already occurred in those regions. The basic recommendation is that EMR will have to be cautious in its approach to promoting either energy conservation or fuelwood substitution in the Labrador, Northern and Central regions as very little incentive apparently exists to invest in energy conservation initiatives, and fuelwood usage may have hit the saturation level.

The overall potential for energy conservation in the four regions is 72%. This varies regionally as follows: Labrador, 72%, Northern, 70%, Central, 73%, and Southern, 71%. Clearly, there is little difference between the regions in terms of conservation potential. Given these basic conclusions, it would be reasonable to assume that conservation initiatives should be directed towards the region where the maximum energy and dollar savings could be derived. If this suggestion were adopted then Labrador would be the area chosen. However, given that the majority of people in the Southern region use oil and have to pay for their energy requirements, it may be easier to convince people there to invest in energy conservation initiatives.

Finally, fuelwood usage could be expanded in all areas except Fogo Island and St. Anthony.

Introduction

Nat French, Conference Chairman

Our next speaker is Dave Stewart. Dave's educational background includes stints at the University of Waterloo and the University of Rhode Island. The areas he's involved in include alternative and renewable engineering analysis, energy audits, and mechanical design.

We did an interesting study in Pinsent's Arm and Norman Bay. I should point out that here we are on the more eclectic end of the energy alternatives spectrum. But I think it's an area where the technologies under study are certainly going to come into prominence in the next couple of years. The advances being made in the technologies are just striking.

I should also point out that Pinsent's Arm and Norman Bay are two communities we found that were not hooked up to any kind of electrical system. There may be a couple of more communities in the province in a similar situation but they wouldn't fit within the definition of being full-time, year-round communities--I don't think.

Perhaps as a result of the interest that was generated by EMR's going into these two communities to do this study, I think that Newfoundland and Labrador Hydro has now announced that Pinsent's Arm will be getting power as soon as the line is finished; poles are halfway there. There's a certain pressure being exerted by the people of Norman Bay to tap into that system or to have a separate diesel system, I'm not sure which.

We'll now turn the proceedings over to Dave Stewart. He's going to give you a brief overview of his findings.

Pinsent's Arm/Norman Bay Study

Presenter: Dave Stewart,
Provincial Consultants Ltd.

The communities of Pinsent's Arm and Norman Bay are typical of the majority of coastal communities in Labrador, (**Figure 1**). They are remote, not connected by road to any other populated centre, and have small populations. Pinsent's Arm is occupied year round while the people of Norman Bay move closer to the fishing areas during the summer fishing season.

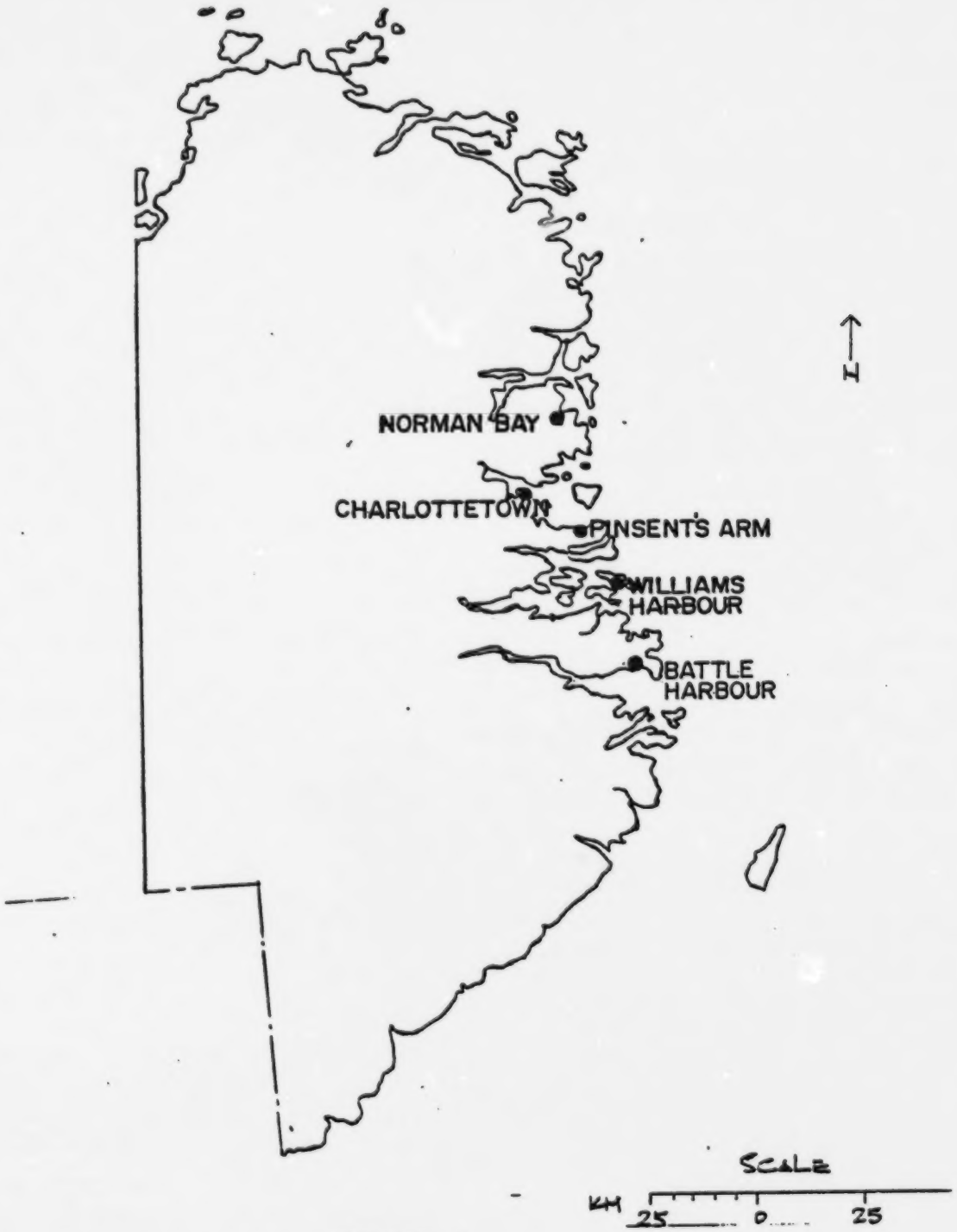


FIGURE 1
MAP OF STUDY AREA
SOUTH-EAST LABRADOR

One of the main purposes of this study is to determine the technical feasibility of renewable energy sources at both communities. In order to fulfil that purpose it was necessary to visit both communities from June 15 to June 22, 1984 to determine the following:

1. photo documentation of existing facilities such as house locations, housing types and industrial/commercial facilities if any

2. preparation of community dossiers similar to the format found in the BRADOR (1983) report (Regional Overview Study Report)

3. documentation of all existing energy consumption patterns and determination of future energy demands

4. identification of potential sites for possible photovoltaic arrays and WECS

Pinsent's Arm is a year-round fishing village with a population of 51 (as of June 1984), located in the northern side of Pinsent's Arm. The area is hilly with individual peaks rising to 200 metres within 2 km of the village. The land where the village is sited forms a small peninsula oriented on a NE-SW axis. The houses are located with the major axis located E-W and the minor ones located N-S.

Norman Bay is the winter settlement for some of the residents of communities such as Venison Tickle and Snug Harbour. Its population from September to June is 56 (as of June 1984). As of the middle of June, the community is deserted until residents move back in mid-September. The surrounding areas is hilly with numerous saltwater bays and freshwater lakes. Norman Bay is broken up into two sections--the main housing base on Norman Bay and several scattered houses on Martin Bay and Trout Cove. These are approximately 1.2 km apart from the main settlement. The houses are located with the major axis located E-W and the minor axis located N-S. From the site survey the energy data for each community has been gathered and presented in **Table 1.**

In order to determine the renewable energy potential for solar and wind energy, a study was conducted to gather all available environmental data on solar radiation and wind statistics.

TABLE 1

ENERGY USAGE IN EACH COMMUNITY

CATEGORY	PINSENT'S ARM	NORMAN BAY	USE
Population	51	56	
Fuel Wood	130 tonnes	130 tonnes	Space Heat
Gasoline	1500 litres	4280 litres	Snowmobile Chainsaw
Diesel Fuel	*5000 litres	N/A	
Furnace Oil	**6400 litres	**6400 litres	School Heating
Stove Oil	N/A	160 litres	Space Heating
Kerosene	N/A	2900 litres	Lighting
Total	1810 GJ	1810 GJ	

* For use in 15 kw Diesel Genset at Community Stage

** For use in School which is the sole user of this fuel.

*** Estimate bases on Pinsent's Arm - no information available during site visit.

N/A Not applicable.

Solar Radiation in the Battle Harbour Region

In Newfoundland and Labrador there are only two sites with a good solar radiation data-base--St. John's West and Goose Bay. In 1983 the AES undertook a program to derive solar radiation statistics for selected sites across Canada. These data are used as input to a computer program to determine the solar-electrical potential at Pinsent's Arm and Norman Bay. From the data, the global solar radiation is 10.29 MJ/m^2.

Wind Energy Potential in the Battle Harbour Region

It has long been recognized by Canadian government authorities that the Labrador coast has the highest wind potential in Canada. Therefore the wind data was analyzed for Battle Harbour. Battle Harbour has an effective mean wind speed of 32 kph. This is the wind speed normally used to determine the amount of electricity which can be generated at Pinsent's Arm and Norman Bay.

Standard and Alternative Technologies

Standard Diesel System

The community load has been calculated to be 110 kwh/day based on Hydro standards for a 10 - 11 household community. The peak demand is approximately 30 kw. The rated generator power is determined by a 15-minute peak as measured by a standard utility demand meter and then doubled to handle the instantaneous (< 5 minutes) load. A standard diesel electric generator design consists of two of three generators supplying an ac distribution grid at 4.16 KVac.

To choose the size of the diesel sets, one must take into consideration that the daily peak load is usually three times the minimum night load and the diesel gensets are usually most efficient when running at 75% to 100% of their rated capacity. See **Table 2** for the projected community loading characteristics. Therefore, it is good design policy to have one small unit to meet the night load. The smallest machine is then turned off and the larger unit switched on for daytime running. the larger unit is sized to handle the daytime load except at noon and supper peaks when the two machines may be required. The standard diesel set for Pinsent's Arm or Norman Bay is outlined in **Table 3**. This design philosophy of having sufficient capacity to meet peak loads is carried through in all the alternative system designs. This standard diesel electric generation system has been costed and used as the bench mark of the study.

TABLE 2

STANDARD COMMUNITY LOADING FOR GENSET FACILITY

Peak kW	30 kW in 1989
Average kW	6 kW in 1989
Average kWh	3600 kWh/household
Average number of households between 1985 and 1989	15 in 1989

TABLE 3

STANDARD DIESEL GENSET
FOR
PINSENT'S ARM OR NORMAN BAY

Diesel Sets Required	1 - 40 kW
	1 - 25 kW
	1 - 12.5 kW

Cycle Charge System Design

A cycle charge or diesel hybrid system is the standard diesel electric set with the addition of batteries, battery charger and inverter. The overall efficiency of the system is increased by running the genset at higher outputs for shorter periods, charging batteries then turning the engine off and letting the batteries and inverter take care of supplying electricity during the low demand periods such as nighttime.

Consequently, the cycle charge system can be used as the basic building block of the alternative energy design. Wind generators or photovoltaic panels can be added to the system to reduce the charging load to the genset. It should be noted that the generator set will never be eliminated because it is more reliable than wind to Pv systems decreases the kw capacity and battery storage as compared to wind or photovoltaic technologies only. The cycle charge system has a much lower installed cost per kwh. **Table 4** is the basic system configuration for Pinsent's Arm or Norman Bay.

Photovoltaic Power System Design

The basic light-energy converter makes a conversion between photons of light energy and dc electricity. This dc electricity can be used directly or indirectly to charge batteries. Photovoltaic cells work as long as there is light available. This means that energy can be extracted from dull rainy days as well as bright sunny days, although at a correspondingly lower level. In fact, batteries can be charged when there is as little as 3% sunlight intensity. The basic building block is called a solar cell which has a nominal voltage of two volts. These cells are interconnected to give voltage and amperage ratings as required.

PV Stand-Alone Design

The initial PV system design is shown in **Table 5.** A micro-computer program entitled, PV F-chart, was used to optimize the array size. The array area can be estimated by determining the month when the lowest peak sunhours occurs and multiplying this figure by the rated peak output of the array required to satisfy the average daily load. **Figure 2** shows a typical solar cell layout.

PV Cycle Charge System Design

When the PV array is used as one of the renewable energy sources in the cycle charge system design, it is optimized for summer usage to coincide with the maximum solar radiation available. This allows the following changes to be made in the PV system design:

TABLE 4

CYCLE CHARGE GENSET
FOR
PINSENT'S ARM OR NORMAN BAY

Rated Power	60 kW (2-30 kW)
Battery Capacity	9 hrs (367 kWh) storage

TABLE 5

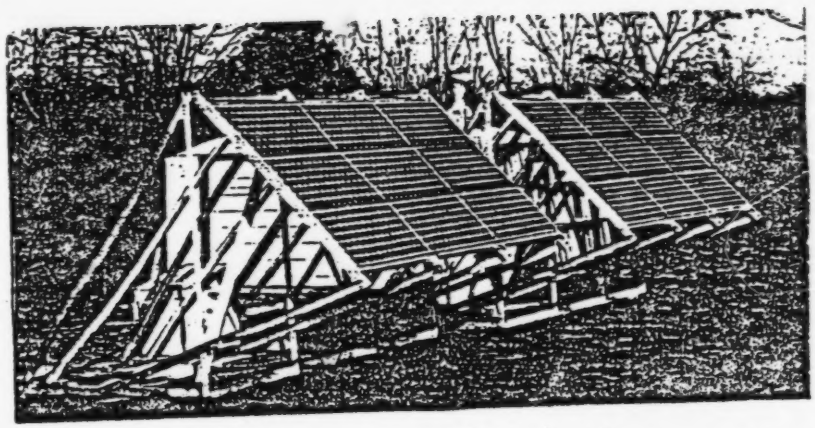
PV STAND-ALONE SYSTEM

Array Power	40.3 kWp
Array Size	526 m^2
Battery Capacity	20 days (5940 kWh) storage

PV CYCLE CHARGE SYSTEM

Array Power	16.13 kWp
Array size	210 m^2
Battery Capacity	9 hrs (.367kWh) storage
Cycle Charge Genset	60 kW

FIGURE 2



PHOTOVOLTAIC ARRAYS

1. the peak watt array size drops to approximately one-half of the stand-alone design

2. the battery capacity drops to the minimum capacity required by the cycle charge system (usually one night storage)

The PV cycle charge system configuration is presented in **Table 5.**

Wind Energy Conversion System Designs

The use of wind as a source of energy is an old approach dating back some 2000 years to the Persian windmill. Many types of WECS have been designed and constructed over the course of windmill history. Today, the most common machines are classified according to their axis of rotation relative to the earth's surface. The major categories of WECS are:

1. Horizontal axis

2. Vertical axis rotors

Examples of these two types are shown in **Figure 3.**

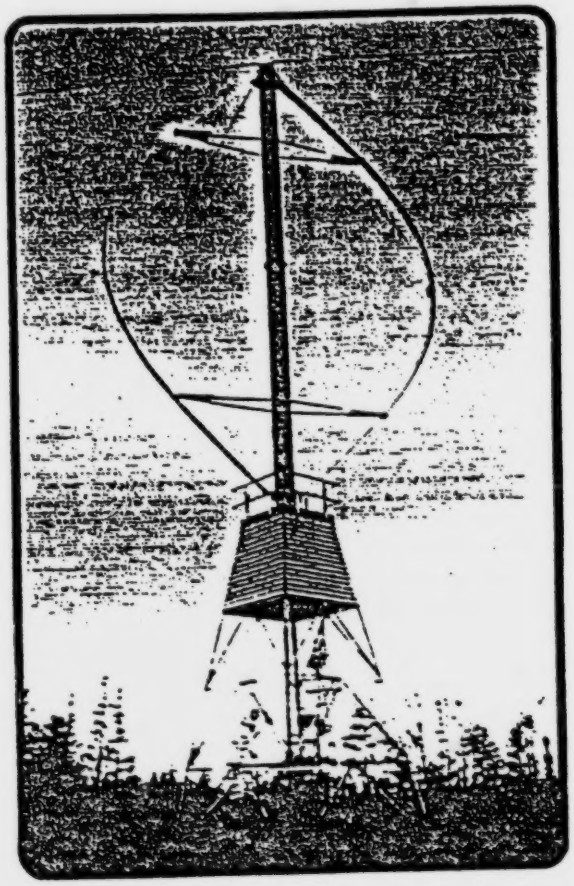
Wind Energy Conversion System Stand-Alone Design

Among the considerations of a wind-only type of installation are 1) determining the number and size of the wind generators, and 2) the battery capacity required. The determination of these two items are not independent as some of the parameters affecting battery capacity are directly related to wind machine capacity.

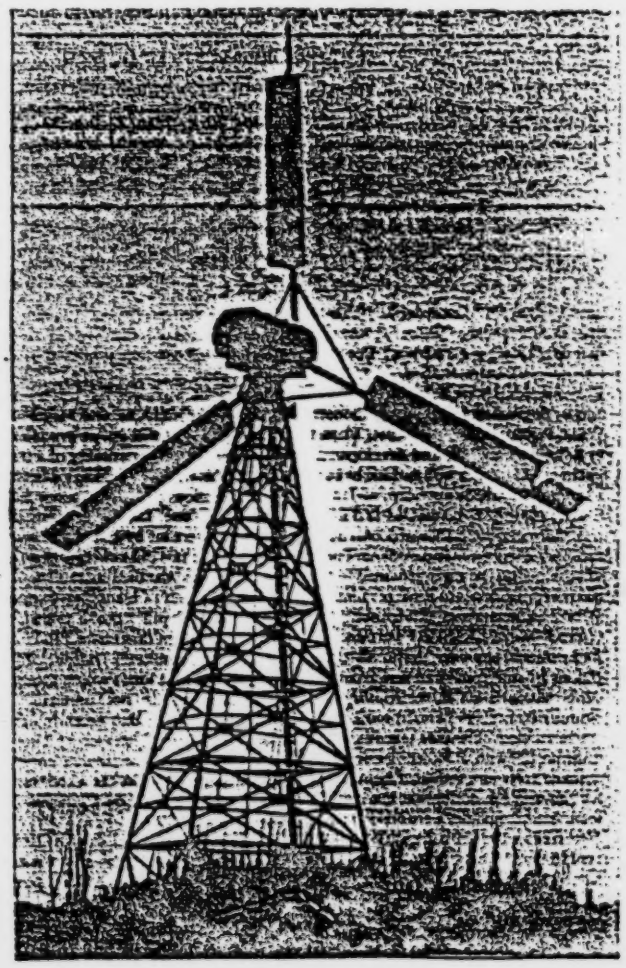
The declining factors of wind machine size and storage capacity must be weighed with practicality. The equipment is selected to satisfy average power requirements of the community under average yearly wind conditions. If, for example, the storage capacity must double due to an occurrence of low wind which happens only several times over 20 years, it is more practical for the community to live with an occasional low power period to continue to be economic.

The minimum wind machine capacity must be such that enough energy can be extracted from operating wind periods to charge the batteries for a low wind period. This situation is probably the most extreme in the lowest wind energy month.

FIGURE 3



VERTICAL AXIS
HOLYROOD, NEWFOUNDLAND



HORIZONTAL AXIS
BUFFALO NEW YORK,

The storage capacity of the batteries is dependent on a number of factors: 1) they must be able to discharge at a rate to meet peak loads, 2) they must be able to be charged at the full power output of the wind machines, 3) they must be above to meet community consumption during low wind periods, 4) be able to recover as much energy as is practical from long windy periods, and 5) have sufficient capacity to offset the occurrence of low available energy during long low wind durations occurring close together.

Economics

Costs for each system were estimated individually and presented in **Table 6.** The lowest system cost was the standard diesel genset and the most expensive was the PV stand-alone system. Included in **Table 7** (N/A), is the generated cost per kwh, excluding labor which parallels the capital cost figures. These were based on a total amount of electricity generated of 39,450 kwh/year. From this analysis the standard set is still the cheapest.

The present worth of a system is the equivalent cash needed on hand to own and operate a system, over an entire selected time period of comparison of the capital costs only.

The lifecycle costs are calculated by using the present worth escalation factor which is the present worth of an annual cost over a selected time period: (n) = 20 years using an interest of money, (i) = 12%, and a cost escalation (j) = 7%. Using the PWEF, the cost per kilowatt hour can be calculated from the present worth of each system and the number of kilowatt hours generated by each system--which in our case is constant.

The more interesting comparison is the difference on the component capital incremental costs. This is shown in **Figure 4.** The lowest cost/peak watt is the 125 kw set. However, Pinsent's Arm/Norman Bay capacity is 60 kw. These costs are based on system configurations which are built to utility standards. The costs for individual systems are discussed later.

Small-scale Case Studies

Solar - B. Higgins

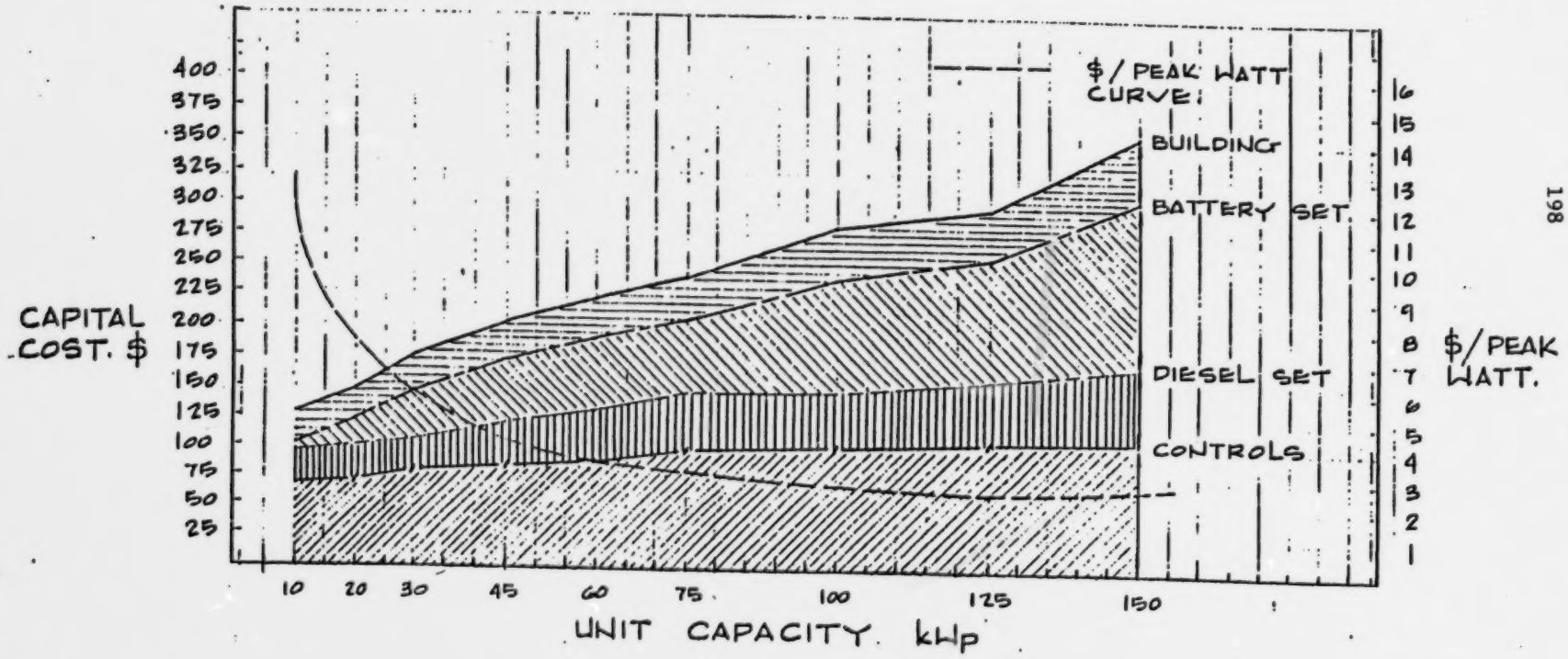
In November 1984 a 10 module (350 watt) peak photovoltaic cycle charge system was installed at the residence of Bart Higgins in Paradise River. The system distributes the power at 12 V DC and has sufficient storage capacity (1120 ampere hours) for five days without sunlight. The power is distributed throughout the house at 12 V DC and 110 V AC. Mr. Higgins uses it for lights and communication and he will be installing a water pump next year. Project summary is available through EMR.

TABLE 6

LIFE CYCLE COSTS vs. SYSTEM CONFIGURATION

SYSTEM	INITIAL CAPITAL COST (1985 $)	LIFE CYCLE COSTS (excluding labour, 1985 $) Total Cost	Cost/kWh
STANDARD DIESEL	296,900	431,000	0.85
CYCLE CHARGE	587,400	699,800	1.38
PV-CYCLE CHARGE	787,100	914,000	1.81
PV ONLY	3,580,500	3,759,500	7.43
WECS-CYCLE CHARGE	607,200	762,900	1.51
WECS ONLY	984,100	1,098,900	2.17

Fig. 4



CAPITAL COST OF CYCLE CHARGE COMPONENTS

Wind - R. King

Mr. King has a 450 watt, 12 V DC WECS stand-alone system installed at his residence in St. John's. It's been in place since March 1985. He uses it to provide electricity for lights, water and communications. He has had few problems with the unit except for the replacement of the wooden blade. Further information is available from the Department of Mines and Energy.

Wind - E. Duffy

Mr. Duffy has had a wind energy conversion utility inter-tie system in place since February 1984. The unit has not been working up to its full output because of technical problems (inadequate swivelling action and poor overspeed control). Further information is available from the Department of Mines and Energy.

All three projects have been documented in a report entitled, Small-scale Energy Demonstration Program - Newfoundland Experiences with New Technology. The report will be available in late December 1985.

Conclusions

At the present time, utility grade alternative energy (photovoltaic, WECS) generating systems, combined with the cycle charge concept, are technically feasible but uneconomic for Norman Bay. However, with advances in manufacturing technology the costs should diminish within five years reducing the central capital costs, and the systems may be economic. Pinsent's Arm no longer requires an alternative system for the following reason:

In June 1985, Mr. W. Marshall, the Minister responsible for Newfoundland Hydro, announced that a powerline would be constructed over the summer of 1985, to connect Pinsent's Arm to the Charlottetown diesel system. This work is under construction and will be completed and in service by August - September 1986.

The small residential systems are feasible and are economic (payback less than five years), if the initial capital cost can be financed.

Nat French, Conference Chairman

I think Dave's presentation points out in a realistic way that there are alternatives even if they are only individual alternatives. In some cases they're not even community-sized alternatives.

Question and Answer Period - Subsidiary Studies

Introduction

Nat French, Conference Chairman

You've got these two high-priced consultants here and right now you can get information from them without having to pay their usually high fees. So, please take advantage of their presence.

Comment

Philip Graham, Department of Mines and Energy

My comment is related to what Paul Bugden said about energy conservation and the perception that wood is free. My comment is directed at the people from the communities, and I wonder if that is in fact their perception. I know that the person from Black Tickle doesn't think it's free. I would think that energy conservation measures would be more readily undertaken by homeowners if there weren't the perception on the part of homeowners that wood is free.

Answer

Paul Bugden, IDP Consultants Ltd.

There are a number of ways to go about trying to assess whether or not the energy conservation potential I cited could be achieved. In the first instance we must emphasize that the potential is very real. The premise of my conclusion is that potential would be hard to achieve because it would be hard to convince people to make the required investments. Right now the majority of people in remote communities, with the exception of the Southern region, are using wood for their energy requirements. Ninety-nine per cent of those people cut their own supply. Where there's no actual payment of cash there is also no true economic cost associated with obtaining wood. The perception that wood is free, combined with low incomes, could make that task of encouraging conservation difficult. That difficulty is compounded when, as one gentleman pointed out, cutting is considered to be a recreational pursuit.

Comment

Nat French, Conference Chairman

I think there's a problem here too with currency systems. On the one hand a person may have the time to procure his wood. But for that same person to reinsulate his home, that's going to require a cash investment. I suppose it's a matter of what value that person assigns to his time, as opposed to the actual cash investment he would have to make to acquire insulation.

Question

Janet Skinner, Norman Bay, Labrador

Does anyone know of any demonstration houses on the southeast Labrador coast that show conservation measures to be effective and worth the investment?

Answer

Unidentified

I believe there are a couple of houses in Nain that were constructed by the Newfoundland and Labrador Housing Commission (NLHC). They are very energy efficient houses. I believe there are also some in Postville.

Question

Nat French, Conference Chairman

Have the houses been in existence long enough to be monitored?

Answer

Unidentified

No. They were only put in last year.

Comment

Janet Skinner, Norman Bay, Labrador

If we're talking about information transfer, the southeast coast is very quiet. We aren't making ourselves heard and the information isn't there for us. It's an education problem and an economics and time problem as well. If it were possible to put some demonstration models in smaller centres, I think it would work wonders.

Answer

Nat French, Conference Chairman

It's not that we're not giving you the information, it's just that from a federal perspective, we don't have it. Nor is the information available at the provincial level. The houses were only been completed in the last year, and it's only after they've been monitored for a couple of heating seasons that you start to get some workable data.

Comment

Philip Graham, Department of Mines and Energy

I wasn't thinking so much of super energy efficient houses so much as common sense insulating measures.

Comment

Nat French, Conference Chairman

There's a cash cost to even regular upgrading.

Question

Unidentified

Did anybody ever take advantage of CHIP and COSP up there? Were they eligible?

Answer

Nat French, Conference Chairman

Oh, yes, we serviced the whole province.

Answer

Paul Bugden, IDP Consultants Ltd.

That was one of the questions we addressed in our study. We asked people if they had used CHIP and/or COSP, and if so, when and to what purpose. On average, about 40% of the people throughout the four regions did take advantage of one or the other programs. The majority of those program users used them for retrofitting. Very little of the money that was awarded to people in those communities was used for conversion. That's logical because COSP was targeted for conversion projects and in as much as the people were already using wood systems, COSP had little applicability.

Comment

Bill Alexander, Canadian Forestry Service

Perhaps one of the reasons that people in the remote communities didn't take advantage of CHIP and COSP, is because there was a lack of suppliers (of insulating materials) who were out advertising what they were doing. I don't think the educational aspect of conservation was very well promoted in the remote communities either.

Answer

Nat French, Conference Chairman

Well, that's why they call remote communities "remote". One of the benefits of living in a remote community is that you don't have people banging on your door trying to sell you on insulation. Nonetheless, your criticisms are valid. Certainly, people in remote communities were eligible, but perhaps they didn't have the market opportunities. Still, if you want all the services and conveniences of an urban centre, then you don't live in a remote community.

The unfortunate thing about CHIP and COSP is that the people who could afford to insulate or convert, readily did so realizing it would be in their best interest. The poorer segments of society, the very people who probably needed it most, were unable to do so because they couldn't come up with the capital cost to get the insulation or to convert to wood stoves.

Just to wrap up today's proceedings, I'd like to say that I think this afternoon has been very informative. We hope it will provide for an effective transition into tomorrow's workshops.

Friday, November 19, 1985

Plenary Session - Workshop Overviews

Foreword to Mini-Hydro Workshop

MICRO HYDRO WORKSHOP

WORKSHOP THEME - Is micro Hydro a practical source of power in remote communities?

The workshop was chaired by Peter Sandland of Energy, Mines and Resources B.C. and the panel was composed of David De Montmorency of Galt Energy Systems, George Sturge of Newfoundland and Labrador Hydro and Laban Davis of Downs Engineering.

The chairman and panel members gave brief presentations on their own views of the practicality and viability of micro hydro as a source of power, and throughout there was a lively discussion of the topics.

The workshop consensus was that technically micro hydro is viable but there were some differing views on applications. George Sturge explained the utilities viewpoint with regard to being mandated to supply firm power; and it came out clearly that due to extremely cold conditions resulting in very limited water flows, that regardless of what alternative energy scheme is put in place a diesel generating system will have to be retained to supply power during these periods.

Whilst George Sturge had talked about larger sized mini hydro, Dave De Montmorency of Galt gave a very interesting talk, illustrating by slides on some of the smaller projects that his company had been involved with in Ontario. It was very interesting to note the different approaches by N & LH and Galt, and there was a good discussion on a possible convergence of approaches in order to bring down the capital cost of small hydro.

A major discussion point of the group was not technical, but focused on regulations from all levels of government that need to be studied and addressed before starting a hydro project. Everyone agreed that governments should consider some form of intervention in order to get these technologies started.

It was also pointed out that any developer interested in pursuing this type of project needs a long term commitment from the purchaser. They need these commitments in order to borrow money from financial institutions. This could be a major stumbling block if the utility is unable to give such long term commitment.

Even though the discussion was lively, there was generally a feeling of co-operation, with the utility willing to look at all the possibilities, and it was proposed that some sort of committee involving the communities, Hydro and both levels of government be formed to keep the idea alive.

Introduction

Nat French, Conference Chairman

I understand you've had some interesting sessions this morning. The workshop chairmen are going to give a brief synopsis of the activities in each workshop. I would like to extend an invitation to anyone who finds that a particularly important point brought up at the workshops--if it's not included in the chairmens' remarks--to just stand up and make their point. The same applies to any inadequacies or additions you'd like to make, so that we can get it down on the conference record.

The first presentation this morning will be given by Peter Sandland.

Peter Sandland, Chairman
Mini-Hydro Workshop

There was a question asked right at the start of our workshop: "Is mini-hydro a practical source of power in remote communities?"

The workshop consensus was technically yes. There were some divergent views on technical applications but certainly everyone agreed that it was possible. The main contention of the workshop was that while small-scale hydro was feasible, there were a lot of regulations governing its application that need detailed examination. Most people thought that provincial and federal guidelines are needed concerning the purchase of power from the utility. The workshop members see the need for political intervention in getting these technologies started. It can't simply be a case of someone's going to a utility and saying we want to do this and the utility developer's having a strong mandate to supply firm power. Developers don't have a mandate to give it a try. It was viewed that there's some political intervention needed to help get some of these things started.

It was brought out that any developer that wants to go into the communities to get one of these projects started, especially small hydro, needs a long-term contract. They need some certainty as to the return they're going to get per kilowatt for a period of up to 10 years, so they can go to the banks with a definite agreement.

George Sturge from Newfoundland and Labrador Hydro came in for a fair amount of flak, but he handled it all quite well. He explained the utility's viewpoint quite well. The delegates ended up with a better understanding of the parameters of Hydro's mandate. It came out quite clearly that in Newfoundland and Labrador, and especially Labrador because of its very cold climate, regardless of what alternative energy system is put in place, diesel generating systems will have to be maintained because if you have a small scheme that doesn't have a 100% storage capacity to last you through the winter, you're going to have to run the diesels sometime during freeze-up.

Someone else made the point that approaching Hydro in a spirit of co-operation was the best course to take--consultation not confrontation.

Question and Answer Period - Mini-Hydro Workshop Overview

Nat French, Conference Chairman

Is there anyone in the house, from any of the sessions, who would like to make a comment or ask a question of the chairman of the mini-hydro session?

Question

Dave Stewart, Provincial Consultants

Concerning development deregulation, would it be in the best interest of remote communities to work together with Hydro on the regulations problem? For instance, if there's a small stream and there has to be an environmental assessment made, perhaps a committee could be struck with the utility and the various levels of government, along with the development association, to see if it could cut through some of the red tape--which has legitimately been put in place to protect us--but nevertheless seems to be getting in the way right now.

Answer

Peter Sandland, Mini-Hydro Workshop Chairman

I don't think anybody used the word deregulation but certainly it was agreed that there is a need to change some of our present ways of thinking. I think Hydro's viewpoint came across clearly. They're very happy to talk to anybody and examine all the possibilities.

Question

Nat French, Conference Chairman

Peter, did your workshop actually propose the idea of some kind of an intervening committee or co-operative committee?

Answer

Peter Sandland, Mini-Hydro Workshop Chairman

That came out at the end of the workshop. Two of the delegates were talking together and thought that might be a good idea, because what's gone on so far in the last three days has produced a need to carry that idea forward. It was suggested that some sort of committee that involves the communities, Hydro and both levels of government keep the push for that idea going.

Foreword to Biomass Workshop

BIOMASS WORKSHOP

WORKSHOP THEME - How long can remote communities continue to burn wood at current rate?

The biomass workshop was designed to deal with the use of alternate fuels such as wood and peat and their impact on oil consumption in remote communities. The workshop opened with short presentations from Mr. W. Buggie, Department of Forest Resources and Lands; Mr. W. Alexander, Canadian Forestry Service; Mr. P. Hewitt, Avalon Peat Harvesting; and the workshop chairman. These presentations set the stage for the discussion on wood and peat harvesting and combustion technology.

The presentation by Mr. W. Buggie dealt with the current state of the art in wood harvesting equipment. He explained the operational characteristics and the associated costs of production. Mr. Alexander gave a presentation on the availability of the forest resource throughout the province and in Labrador, highlighting areas in which the switch to woodfuel has caused concern over the amount of overcutting taking place. Mr. Hewitt's presentation dealt with the peat resource and in particular the harvesting project being carried out in St. Shott's by the Southern Avalon Development Association.

It has become quite evident that a significant number of home and commercial establishments are now heated by wood and the trend is likely to continue. Rural areas have much higher statistics than do the urban areas and it is in these rual areas that all of Newfoundland's remote communities are located. Therefore, the long term availability of alternate fuel resources such as wood and peat are of particular importance. This issue was the focus of the workshop and the subsequent discussion centered around more efficient use of the resource, better controls on cutting, new techniques for increasing forest yield and growth, and new technology to improve harvestable volumes.

Introduction

Nat French

The next workshop we're going to hear from is biomass. Paul Duffett will give us a synopsis of what was discussed in that workshop.

Paul Duffett, Chairman
Biomass Energy Workshop

First I'd like to thank everybody for the great attendance we had at the workshop this morning. I did a quick survey and pretty well all the people that indicated their intention to attend did so.

The theme for our workshop was, "How long can remote communities continue to burn wood at current rates?" Our discussions centred around the resources--wood in particular--that are available to remote communities. There was also a great deal of discussion as to the new ways in which people are using wood, the increase in productivity from the various land, and with respect to the utilization of other not so conventional fuels such as peat. The point was made that while there's been quite a bit of work done concerning technologies, a lot of people are not certain what those technologies hold for them with respect to how they employ the energy, be it for residential heating or a bit larger scale.

The opportunities seem to be there but I think the workshop consensus was that we should have a much better system in which to get the information out to people who need it most; to further explain the economics of various systems that are used for harvesting and burning wood and peat. I think that in the future those needs are going to be addressed more fully.

Question and Answer Period - Biomass Workshop Overview

Nat French, Conference Chairman

Does anyone have any comments of questions that they'd like to share?

Comment

Bill Clarke, Department of Forest Resources and Lands

The only comment I'd like to add to Paul's comments is with regard to how long the resource can last. I think the success for the small industrial units for biomass production, depends on how well they're integrated with commencement sawlog and pulpwood operations.

Comment

Unidentified

It's been very evident that there has been some transfer of information in the remote communities but the bottom line is that one has to bite the bullet and do it.

Comment

Patrick Cabot, West St. Modeste, Labrador

From a community's perspective, conferences like this enable us to narrow our energy alternatives. The conference has certainly made it apparent that there are no quick solutions to our energy problems, but it does help us to define our options.

Question

Nelson Bennett, Pasadena Economic Development Committee

I am somewhat disappointed that we haven't investigated another source of energy--the oldest indigenous power resource in the province--animal oils. I'm including fish with that. Apparently, one of the fish plants utilizes this resource and I'm wondering what their success has been with it?

As I see it, in Newfoundland we throw away approximately 60% of our fish, a lot of which contains oil. We have quite a seal population that builds up quite a bit of that product as well. It seems that somewhere along the line someone should investigate the possibility of utilizing that energy resource.

Answer

Nat French, Conference Chairman

To the best of my knowledge, the extraction process for fish oil is quite expensive. The seal issue is a very sensitive one and an entirely different matter altogether. Under a federal/provincial agreement EMR funded the burning of fish oil in some fish plants. Perhaps John Drover of Mines and Energy could comment on this topic.

John Drover, Department of Mines and Energy

Fish oil has been burned at Isle aux Morts, to a larger extent in Black's Harbour, N.B., and Fishery Products has burned some in Gaultois. The problem with burning fish oil is the fluctuation in the price of fish oil. Fish oil is used in shortening and that kind of thing, so it's a product that one can sell as a food stuff. What you have to do is compare what you're getting for your fish oil with what you're paying for fuel oil. That is what happened in Isle aux Morts. Once they put in their system the price of fish oil rose enabling them to sell the fish oil at a better price.

The extraction process is quite simple in fact. Once you've got your oil its just a matter of adjusting your burners. I think the conversion at Isle aux Morts was about $2500 to $3000.

Comment

Nat French, Conference Chairman

So it's obviously market sensitive. If you can get a higher value for it as a food additive it's much better than burning it.

Answer

John Drover, Department of Mines and Energy

Yes, and Fishery Products and people like that have been burning it for awhile too on an experimental basis. We gave them some money to convert at Gaultois. It's only a very small amount of money involved.

Foreword to Wind Energy Workshop

WIND ENERGY WORKSHOP

WORKSHOP THEME: "Does wind energy make cents?"

Harnessing the energy in the wind is a centuries-old idea that has met with at least its share of problems in being updated and applied to modern energy needs. The purpose of this workshop was to air some of the technical problems and social, institutional, political, and economic issues which must be addressed before wind energy becomes a practical alternative to meet the energy needs of Newfoundland's remote communities.

The workshop convened with brief opening remarks from the panel members: Ms. Monique Carpentier, Energy, Mines and Resources Canada; Mr. Craig Toepfer, Earth Energy Systems Incorporated, Eden Prarie, Minnesota; Mr. Duncan Hume, Howden Group Canada Limited, Scarborough, Ontario; and Mr. David Hood, ShawMont Newfoundland Limited. In view of the fact that modern wind energy technology is complex and less well known than some of the other alternatives, Ms. Carpentier's remarks consisted of a brief introduction to the technology, its possible applications and some of the major technical problems which must be overcome. Remarks by Messrs. Toepfer and Hume provided a brief history of the evolution of wind energy in the United States and Britain. Mr. Hood related some of the important results of a study conducted by ShawMont Newfoundland Limited into possible applications of wind energy in remote communities in Newfoundland and Labrador.

The focus of the ensuing discussion did not remain with wind energy but quickly broadened to deal with the social, political, and institutional problems of supplying energy to remote communities. While there was a general interest in the possibilities for wind energy, the general consensus was to leave the technical problems to the experts but the people wanted to feel confident that all options for lower energy costs were being considered.

In summation, the consensus of the workshop was that it was too soon to tell whether or not wind energy made "cents" but it was generally felt that answers to the social, political, and institutional issues affecting energy in general were at least as important as solutions to the technical/economic problems of wind energy.

Introduction

Nat French, Conference Chairman

Our final workshop chairman is Graham French. He headed up the wind workshop. I'm looking forward to hearing his brief.

Graham French, Chairman
Wind Energy Workshop

We started off our workshop talking about all the various aspects of technology--the reliability of the costs, the research and development, and the environmental and social issues as well. One gentleman from the audience summed it up by saying that the use of wind power is just as much a social and political problem as it is a technical problem.

Communities feel that high energy costs and the availability of energy are affecting their economic development. They need a reliable supply. They don't expect it to be particularly cheap but they expect it to be reasonable. The other thing is that people think they need to be informed of what their energy options are so that they can help to achieve them. Ultimately, they will leave it to government agencies and utilities to decide how. They don't see themselves as being technical experts, telling people how to do it, but they do want to be sure that it is being looked at and that it is being done. They want to know how to get started on helping themselves.

If we had to draw a conclusion about wind energy it would be to say that right now it's still too early to tell if it makes sense. We do think there is some promise for the future.

Question and Answer Period - Wind Workshop Overview

Question

Elliot Rodger, EMR

I'm wondering how much interest there was in individual house-scale or building-scale applications of wind, as opposed to community-scale or wind farms?

Answer

Graham French

That question did come up. There are two points of view on that. There certainly may be potential to reduce overall system costs. The jury is still out but it's being looked at. Some other people pointed out that it's also important to ensure that you have a reliable community supply of electricity. Nobody likes to be unable to cook their turkey dinner because the power is out just to their house.

Comment

Patrick Cabot, West St. Modeste

I think remote communities feel very strongly that we would like to see Hydro and the department put some money into the demonstration program; to run a couple of pilot projects in various areas of the province to see if that's the system that could help alleviate our energy problems.

Answer

Graham French, EMR

Mr. Cabot is quite correct. That's one of things that did come out of the workshop and it's an important point.

Comment

Terry Nippard, Department of Rural, Agricultural and Northern Development

I perked up this morning when I found out there's a possibility that some of the projects Mr. Cabot just spoke about may be pursued; some effort made to run pilot projects.

Answer

Graham French, EMR

Yes, Phase II of the RCDP has a demonstration phase. One of the reasons we're here now is to solicit your opinions and input as we move into that phase.

Question

Terry Nippard, Department of Rural, Agricultural and Northern Development

Is there anything you have in mind right now that might be used as criteria in determining what sites might be suitable for a demonstration program?

Answer

Graham French, EMR

Not yet.

Comment

Dave Stewart, Provincial Consultants

From the talk yesterday, the verdict is still out on the performance of small-scale wind turbines based on tests that have gone on over the last three or four years. Still, I think there's a need to scale it up, perhaps to a wind farm scale or at least one of a larger unit.

Question

Terry Nippard, Department of Rural, Agricultural and Northern Development

How many participants are attending this conference?

Answer

Nat French, Conference Chairman

There are about 142 participants, 96 community representatives and the rest from manufacturing firms, government departments and consulting agencies.

Question

Terry Nippard, Department of Rural, Agricultural and Northern Development

In reference to Mr. MacDonald's information, is there something available for communities that might be a little bit easier to decipher?

Answer

Nat French, Conference Chairman

I'm not sure if the P.U.B. has a pamphlet or booklet on the operation of the Board, but I'll certainly check into it for you. If there is one I'll have Mr. MacDonald send copies around to perhaps all the communities.

Answer

Graham French, EMR

It's one of the roles of our regional office to be disseminators of information. It's our job to support you in helping yourselves vis-a-vis energy issues.

Comment

Nat French, Conference Chairman

I think that one thing that we were worried about when we put this conference together, was that we would unrealistically raise expectations just by talking about alternative energy technologies. One of the things that you have probably come to appreciate over the last three days, is that some of these technologies are at various stages along the road to being completely reliable. Biomass and hydro would seem to have a better track record, in a technological sense, than wind. There are generally a lot of questions that still arise as to the reliability of wind. Some of these technical questions have yet to be resolved.

I'm pleased to hear a recommendation that demonstration projects actually be implemented. We've done a fair amount of resource assessment and a fair amount of pre-feasibility work, so it may now be a logical step to move into full-fledged demonstrations. Our department has every intention of consulting with the communities and one of the benefits of having this conference is that it gives us a list of contact people.

Energy is all-pervasive. It affects everything we do--our level of comfort, our standard of living, everything. EMR, Hydro and the Department of Mines and Energy, tend to view energy from a narrow perspective. We're looking at energy projects per se. But at a conference like this there are a lot of socio-economic issues that get discussed. It's very difficult for us to separate those socio-economic issues. We all get wrapped up in the fact that we want to do a good job and we want to make life in remote communities as comfortable as any other place. There's almost a dichotomy between what we're being paid to do and what we would like to do. The great thing about this particular forum and this particular program (the RCDP), is that we hope to be able to combine both; to be able to do a good job of getting our technologies into operation and to be able to improve the standard of living for remote communities.

Comment

Dave Stewart, Provincial Consultants

If we know that the subsidy to the rural communities is to the tune of $23 million, maybe someone should look at setting up an incentive program whereby communities could tap directly into that subsidy, on the understanding that they pay back their borrowings, and use that money to develop energy alternatives. Such a mechanism would give the communities a sense of self-help.

Answer

Nat French, Conference Chairman

Perhaps one the Hydro people should be consulted on that. It's obviously a policy question and I don't think the question is appropriately addressed at this type of conference.

Comment

Malcolm Lodge, Institute of Man and Resources, P.E.I.

I think what the gentleman just addressed is popularly called the concept of the level playing field. Being in the private sector and attempting to see these technologies, particularly wind technology, implemented, it seems it's not technological problems that we have today--we can find systems that manufacturers will stand behind--but institutional ones. It's the problem of dealing with the utilities, communities, with the subsidy level, and getting that money redirected so that the communities then have a say in how that subsidy money is spent, in a way that they feel is going to encourage the development of alternative energy systems in remote communities.

Chairman's Concluding Remarks

Nat French

We've discussed a wide variety of problems and issues and one of the reasons that the conference was called Energy Issues and Alternatives, was so that there would be an avenue of discussion for those concerns. I'm extremely pleased with the results of the last three days. The conference has been enjoyable and informative and let's hope we're going to see some projects arising out of it in co-operation with the communities.

It will be interesting to see if a competitive process arises between individual communities. I don't think I'd like to see that, but it will be interesting to see if that is what actually happens.

I don't wish to review the highlights of the conference but I would like to note that this is the first time that all the players in the field have met, rubbed shoulders, and exchanged information and views. That aspect of the conference is probably just as important as the technical sessions we've been party to. Now you know there's a face you can identify with. If you've got a problem you can respond in a more effective manner.

Secondly, we've had some very impressive policy and action statements by Newfoundland Hydro and by the Minister of Mines and Energy, Mr. Dinn. If you hold those two agencies to the things that they've promised at this conference, then the implementation of demonstration projects is going to be a lot easier.

As much as I'd like to hand out a wind turbine or a hydro project to everyone as they leave, I don't think anyone realistically expected that. Even understand a little bit of the complexity that goes into the decision-making process to put one of these projects into a community benefits us all.

Thirdly, this process has allowed EMR to set the stage for transferring some of the information that we've acquired here, out there to the end users. EMR has traditionally been a very scientific oriented department. One of the things we need to do better is to interact with other players in the energy alternatives game. This conference illustrates and enhances the potential for co-operation that exists between EMR, Hydro, RAND, the Rural Development Council, and the development associations. The stage is set for effective communication. That's a significant first step.

In Phase I of the RCDP we sought out data. That's why we did resource assessment and feasibility studies. In Phase II of the RCDP, based upon the information garnered in Phase I, we hope to be move into demonstration projects. We don't have a lot of money to do it. I should point that out up front. We do have some seed money; however, in some cases it won't run more than 5% or 10% of a project's cost. If we can use that seed money to entice other organizations and agencies into putting up matching funding to help get some of these projects off the ground, then we'll have achieved something substantial.

In Phase II over the next few years, we'll be trying to work directly with communities. That is going to be the difference that separates what we did in Phase I from Phase II. Granted we worked through some development associations in Phase I, but in Phase II we're going to be working directly with communities. We're going to bring in all the other agencies too.

Finally, I would like again to thank all the agencies involved with the conference. We couldn't have had a conference without the input of Newfoundland and Labrador Hydro, EMR, RAND, the Rural Development Council, the development associations, Memorial University's Division of Extension Service and indeed, you the delegates.

Presenter: **Jerome W. Dinn, MHA**
The Honourable Minister of Mines and Energy
Province of Newfoundland and Labrador

Thank you very much Mr. Chairman, head table guests, ladies and gentlemen.

I've gotten to do this kind of thing quite a bit recently. I was out in western Labrador last week at a mines managers conference, then we had a western Labrador economic opportunities conference. I was quite taken aback in that they asked me to speak to the gathering there. Before I got up to speak they had several people who had a few words to say. By the time I got to the mike, it was almost like a Jerry Dinn roast. They talked about everything that was bad about what I did in Labour and Manpower for five-and-a-half years.

Anyway, this seems to be a little more friendly bunch. I guess I'll find out a little later just how friendly this crowd is. But to get on with it, I want to thank you Nat (French) and the conference organizers for inviting me here to speak to you.

It is a pleasure to have this opportunity to speak to you on the important subject of energy in remote communities in the province. It is also a pleasure to see how well represented these communities are at this conference. Nat indicated to me earlier that there are something like 96 people here representing communities--the 77 remote communities that have been designated. This clearly reflects your interest in the subject of improving energy conditions in your areas.

I sincerely commend EMR for organizing this event, and its objective of focusing attention on the energy problems of the remote communities in our province. As a former minister of municipal affairs and housing, and also of transportation and communications, I have become well aware of the continuing problems associated with living outside the mainstream of life and activity in the province. My own energy staff is closely involved with our federal friends in a number of energy projects relating to the remote areas of the province. We have a strong and continuing interest in improving the energy efficiency of housing and other buildings in these isolated areas, and in promoting the use of wood, small-scale hydro developments, wind energy, and any alternative techniques which will reduce the growing economic burden of the conventional forms of energy--electricity and oil.

In co-operation with the federal energy department, we are at present developing a comprehensive program designed to promote energy conservation and alternate energy technologies throughout the province, and to build on the earlier programs such as CHIP, COSP, the Conservation and Renewable Energy Demonstration Program, and the National Energy Audit Program. We are convinced of the value of these programs and are determined to improve upon them, with special emphasis on the economic spinoffs from alternate energy development.

My department in recent years has been active in promoting economic use of biomass fuel--primarily wood. While we have had to work to a modest scale, the results have been encouraging. Newfoundland Hardwoods at Clarenville is now saving $2.5 million dollars per year by using wood instead of oil. Apart from this clear commercial benefit, new jobs have been created in the area to supply and process the wood. The technology involved could apply in a number of remote communities.

As you are well aware, the provincial government has a considerable interest in reducing the cost of delivering electricity to the 77 remote communities now serviced by diesel generated electricity. Annually, the government is spending about $23 million to subsidize the cost of production of electricity in these isolated communities. As the cost of diesel goes up so will this subsidy tend to increase. It is the government's policy to connect as many communities as possible to the island grid, but geography and transmission costs will prevent many of the communities from achieving connection in the foreseeable future. It is therefore in everybody's interest to encourage alternative ways of reducing dependence on electricity in remote communities. It is equally important to do everything possible to reduce dependence on oil products--heating oil and stove oil in particular--in remote areas.

Newfoundland has the dubious distinction of having the highest petroleum product prices in Canada, and next to Prince Edward Island and Nova Scotia, the highest electricity prices in the country. The latest information I have from the PDD staff is that the regular domestic customers in diesel areas are paying about 22% more per year than regular domestic customers in interconnected areas, although they are using on average about 20% less than households in interconnected areas.

Clearly this shows the diesel served areas to be at a great disadvantage. But it also places government in difficulty. One way to reduce the cost imbalance is to further subsidize the cost of producing diesel generated electricity; that is, to shift the

burden to the taxpayer in a province that is already the highest taxed in Canada. Another route would be to increase the rates of the interconnected customers to provide the necessary subsidy funds. Both these options are financially and politically unacceptable. The government is already under severe economic pressure to stabilize its expenditures, to reduce the subsidy and to control rate increases.

The more positive approach is obviously to reduce our dependence on diesel generation, and we have made considerable progress to date in this area. I think you will agree there has been quite a bit of progress over recent years to reduce the number of diesel plants from 52 in 1980, to 39 today. Expanded interconnection is the continuing long-term policy of the government but it is obviously limited by the amount of capacity available. As you are well aware, all major economic hydro resources of the island have now been harnessed and the remaining economic options on the island--in the absence of an in-feed from Labrador--appear to point to additional oil- or coal-fired units.

The government's central aim is still to organize a flow of Labrador power to the island, but the political and financial obstacles remain immense. When Labrador power is transmitted to the island, it will be quite expensive.

Against this background of energy supply and cost prospects, it makes great sense that the remote communities should do all they can to reduce their dependence on a restricted supply of high cost diesel electricity and on relatively high cost petroleum products. A review of recent figures indicates clearly that the people of our remote communities for some time have been acting effectively to reduce their dependence on petroleum products for space heating. One of the recent surveys produced by the Remote Communities Energy Program, indicates that over 50% of householders use wood as the principal heating fuel (64% in Labrador), and almost all of them cut their own wood. This is self-help on an impressive scale and compares with about 15% wood usage for the province as a whole.

However, there remain significant areas for improvement. Mainly due to geography and climatic conditions, oil usage, especially in remote communities in the north and in Labrador, is well above the provincial average and presents a serious cost burden for many households. Yet survey information suggests that insulation and other conservation action has not been widespread in these communities. For example, only a quarter of households appear to have taken advantage of the CHIP as apposed to 61% for the province as a whole. Only 8% appear to have applied for COSP grants compared with 25% throughout the province.

Considering that the remote areas are the places with the greatest need for reducing their energy costs, these survey figures are surprising. They indicate either ignorance or apathy on the part of householders in our isolated communities, or a serious lack of promotion and enterprise by contractors serving those areas.

Whatever the reasons, there remains considerable potential for improving energy savings by increased retrofitting of households. This is a serious challenge to me and with the assistance of our federal colleagues, I will be stepping up our efforts to assist and promote conservation actions in the remote communities as soon as possible.

How can we diversify the energy supply of the remote communities? How can we apply the latest techniques to utilize the latent energy resources of our remote areas: the extensive unused wood supplies especially in western and central Newfoundland, the possible small hydro sites like the one built at Roddickton? Can we harness the ever-present wind? What are the economics of such exercises in remote communities? Do they have other benefits that enhance the lives of our people in the remote areas, and perhaps create new activities that will stimulate employment in these communities?

These are the questions that are being addressed in this conference which is revealing for the first time in public many of the studies that have been undertaken to provide some of the answers. What these studies have done is give us some measure of the potential for diversifying the local energy supply and of the potential for further energy savings. They have also pointed out some of the non-viable options. We must not waste time pursuing hopeless objectives.

You will agree that the money for these studies has been well spent. We are now much better informed as to the potential of some of these alternate energy projects. It is now up to all the agencies involved--the local development associations, Hydro, the provincial government and the federal government--to examine the new information and to pinpoint those projects which can most usefully be applied in which communities.

Tomorrow morning you will be wrapping up the conference with the workshop sessions. I wish you well in your discussions and I look forward to hearing their results--and of the new ideas and initiatives which they will produce. Much has been done but much remains to be done. I can assure you the provincial government will do its best to keep up its present momentum.

Thank you for inviting me and I hope you have a successful conclusion to your conference tomorrow.

APPENDIX A

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APPENDIX B

ACKNOWLEDGMENTS

As anyone who has ever been involved in organizing and implementing a conference knows, the endeavour is filled with endless possibilities for the enacting of Murphy's Law - "Anything that can go wrong, will." However, despite having to face logistical tasks such as arranging for flights from remotest Labrador and the de facto booking of almost every hotel room in Corner Brook, the Energy Issues and Alternatives Conference ran smoothly from start to finish organizationally and in every other way.

Obviously, this fact was not due to chance. People made it happen and people should be acknowledged and thanked. Foremost among these is Mr. Paul Duffett from Energy, Mines and Resources in St. John's. Paul's role was basically that of chief organizer, and through insight and long hours he filled it magnificently. Another to whom much must be acknowledged is Miss Madonna Kent of Memorial University's Extension Service. Madonna provided yeoman service, both prior to the conference handling the thousands of little details which needed to be addressed and during the conference in Corner Brook ensuring things ran smoothly. Acknowledgment is due as well to all the consultants, corporate representatives, government officials and resource people who gave so freely of their time so that the conference could gain the benefit of their expertise. In this regard, a special acknowledgment must be made to the Honourable Jerome Dinn, Minister of the Newfoundland Department of Mines and Energy, for his appearance at the conference and his speech setting out his government's encouraging policy for energy conservation and alternative energy in remote communities. Finally, the editors wish to expressly acknowledge the contribution of the personnel of the Division of Extension Service, School of Continuing Studies and Extension, Memorial University of Newfoundland.

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